3.3 PLANTS AND ANIMALS

This section characterizes existing plant and animal habitat and conditions on and adjacent to the project site. Potential impacts to plant and animal communities from infrastructure development and full buildout identified under the Proposed Actions (Alternatives 1 and 2) and the No Action Alternative are also evaluated. This section is based on the February 2005, Plants and Animals Assessment prepared by Raedeke Associates (see Appendix D). The summary of fisheries conditions and habitat, is based on the February 2005, Fisheries Technical Report prepared by Cedarock Consultants (see Appendix E).

3.3.1 Affected Environment

Plant Communities

Plant communities were inventoried, classified and described through a review of existing federal, state and local mappings; interpretation of aerial photographs; and, field surveys on the project site performed in March, April and June 2004. Additionally, the Washington Natural Heritage Program (WNHP 2004, 2002, 1997, 1981) and species accounts and descriptions from other sources were consulted regarding the likelihood of occurrence of endangered, threatened, or sensitive plant species on or in the vicinity of the project site.

Vegetation on the project site is classified as the Western Hemlock Zone, which covers most of western Washington. In the old-growth condition, forests in this zone are typically dominated by western hemlock and Douglas-fir. However, the entire site has been altered by past logging, clearing, agriculture, and other land uses. Based on review of existing mappings, aerial photographic interpretation, and field reconnaissance, the site is divided into a variety of vegetation cover types, including both wetlands and non-wetlands (see Figure 3.3-1). The following sections describe the major vegetation cover types currently found on the site.

Uplands

Upland (non-wetland) areas encompass most of the site. Five general upland cover types were identified on the site: agricultural, lowland shrub, second-growth lowland forest, grassland, and urban. The hillside onsite consist mostly of the forested and shrub habitats. Urban areas, agricultural fields, and grasslands occur in the lowlands.

The distribution of these cover types onsite is shown on Figure 3.3-1. The cover types are briefly described below; additional descriptions of the cover types are found in Appendix D.

Agricultural Fields (Ag)

Agricultural fields occur in the central and southern portions of the site, east of Frager Road in the central portion of the site, and most of the area south of the existing east-west trending flood control barrier dike. Corn is the primary crop on the majority of the agricultural fields. Agricultural fields in the southernmost portion of the site (south of S 204th Street) are farmed wetlands (see Section 3.4, Wetlands, and Appendix F for details).

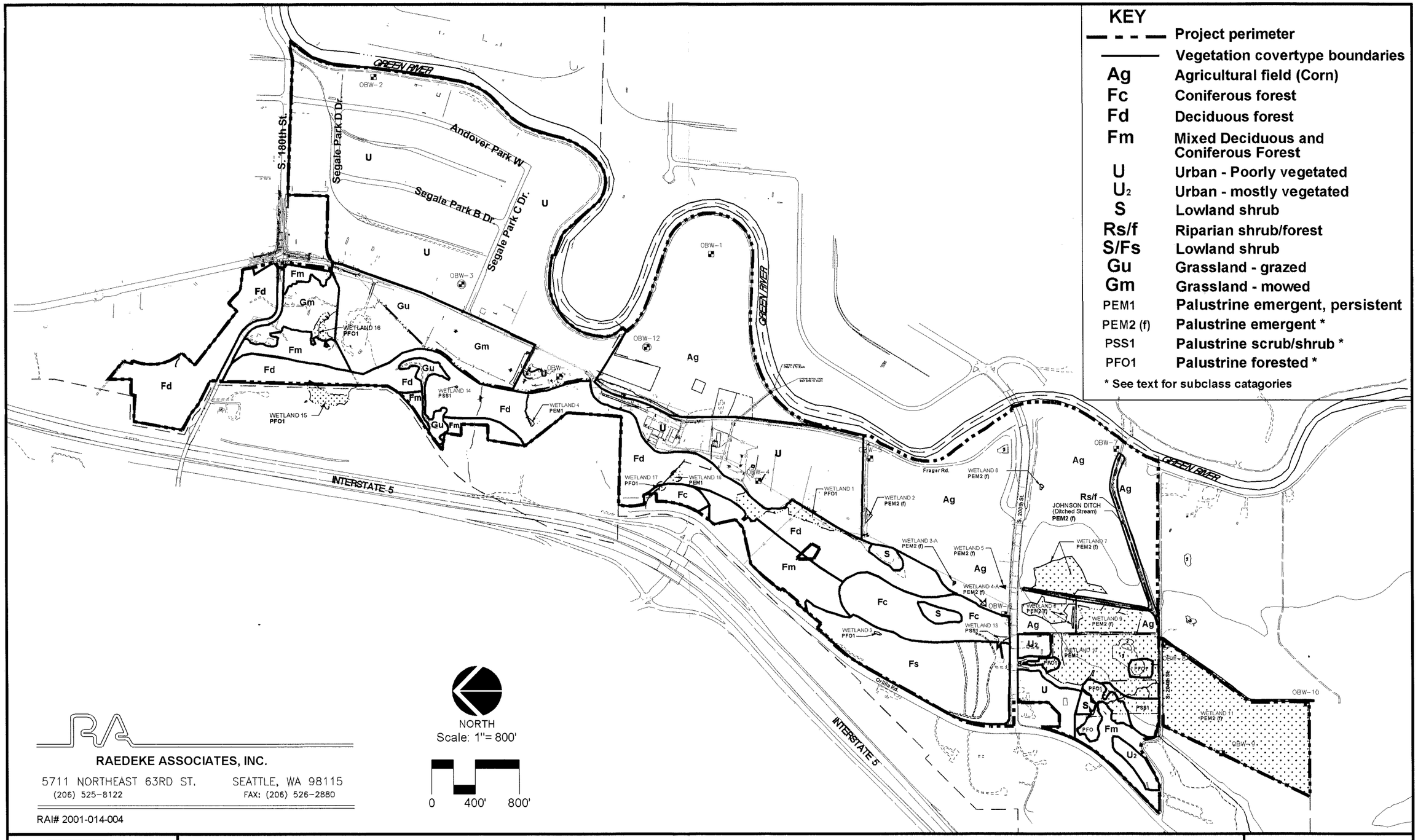

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Figure 3.3-1
Vegetative Cover Types

Tukwila South Project EIS

Lowland Shrub (Fs, S)

Shrubland habitat occurs within the powerline corridor and on either side of the conifer stand, just north of S 200th Street, on the old gravel mine site on the upper plateau, and in smaller patches on the lower hillside (see Figure 3.3-1). Scattered patches of shrubland also occur in disturbed openings and on old roads. Two shrubland variants typically occur, shrub/sapling state of forest succession (Fs) and persistent shrub (S) (for a complete description of shrublands see Appendix D).

Coniferous Forest (Fc)

Second growth conifer stands (Fc) that are approximately 70 years old generally occur in two distinct stands on the hillside in the southwestern and west-central portion of the site (see Figure 3.3-1). The conifer stands are dominated by Douglas-fir trees to 30 inches diameter at breast height (dbh).

Deciduous Forest (Fd)

Broad-leaved deciduous forest stands dominate the hillside that runs north to south along the western boundary of the site and include a mixture of big-leaf maple, red alder, and other deciduous trees, with scattered conifers (see Figure 3.3-1). Pacific madrone trees are a minor component of the northern deciduous forest stands west of the llama farm. Of this forested habitat, there are two distinct age classes found onsite. The older stands (60 to 70 years old) generally occur onsite south of the llama farm. Younger stands (approximately 30 to 40 years old) occur west and north of the llama farm, in the northern portion of the site. Medium sized snags from 10 to 25 inches dbh, occur in small stands in the older forests, and small and larger snags are scattered throughout. See Table 4 in Appendix D for a complete list of species in this cover type.

Mixed Forest (Fm)

The majority of the broad-leaved deciduous and evergreen conifer mixed forest grows on the upper portions of the forested hillside and upper ravines in the western portion of the site (see Figure 3.3-1). Small patches of this forest type are scattered throughout the deciduous forest. The species composition is similar to the deciduous forests noted above; however, a higher percentage of conifers are present (see Table 4 of Appendix D).

Grassland, Unmowed (Gu)

The grassland, unmowed cover type is present on the llama farm fields located in the north-central portion of the site (see Figure 3.3-1). This habitat is grazed by the llamas, which prevents these areas from developing into shrubby or forest cover. A few scattered trees occur in this habitat.

Grassland, Mowed

This cover type consists of grasslands maintained by repeated mowing and includes the golf driving range in the northern portion of the site, and a few rural residential lots north of the llama farm (see Figure 3.3-1).

Urban, Mostly Vegetated (U2)

This cover type consists of areas with mowed lawns, with less than 30 percent cover of structures or impervious surfaces, and more than 40 percent cover of shrubs and/or trees. These areas occur in the southwestern portion of the site and include a few houses and associated residential features (see Figure 3.3-1).

Urban (U)

A large portion of the site consists of urban habitats dominated by buildings or other impervious surfaces and very little vegetation (see Figure 3.3-1). These areas are primarily located in the northeastern portion of the site, and are scattered throughout the remainder of the site.

Riparian Habitats

River and stream habitats are described under Fisheries below. See Section 3.2, Water Resources, and Appendices C and E for a detailed discussion of the streams and ditches on the site.

Riparian Shrub/Forb (Rsf)

A minor portion of the site consists of narrow bands of riparian shrub-forb habitat as defined by King County (1987), including existing Johnson Ditch and the various ditch segments in the agricultural fields in the southern portion of the site (see Figure 3.3-1). This habitat also occurs along portions of Ditch E at the toe of the slope of the forested hillside. Riparian shrub/forb habitat lines some of the ditches in the agricultural fields, streams and wetlands on the hillside, and the Green River (see Appendix D for a list of species in this cover type).

Freshwater Wetland Habitats

The site contains 19 wetlands totaling approximately 48.6 acres, based on previous and current delineations. The wetlands are scattered from the north to south end of the site and consist of palustrine, emergent (PEM), scrub-shrub (PSS), and forested (PFO) communities (see Section 3.4, Wetlands, and Appendix F for details).

Special Habitat Features

Special habitat features include biologic elements, such as edges between plant communities or successional stages, snags, and coarse woody debris that are often important to wildlife. The most distinct edges on the project site are those between the forested communities on the hillside in the west portion of the site and low-stature habitat, such as the agricultural fields, llama farm, and scrub-shrub wetland cover in the central and eastern portions of the site.

Snags (dead or partly dead trees at least 4 inches dbh, and 6 feet tall) are important to many wildlife species for nesting, feeding, and roosting. Moderate numbers of snags are widely scattered across the forested areas of the site, including within the forested and tall shrub wetland systems.

Coarse woody debris onsite includes downed logs, stumps, and major limbs of trees lying on the ground. Downed logs provide many habitat features, including perch sites, food, nest cavities, and cover for many species, such as some amphibians. Low to moderate amounts of scattered downed logs were observed in all the forested stands, and consisted mainly of small to medium-sized red alder.

Endangered, Threatened, and Sensitive Plant Species

There are no Federal or State threatened, endangered or sensitive plant species known to exist on the site. Based on habitat descriptions for endangered, threatened, and sensitive plants species of Washington, field surveys and the Washington Natural Heritage Program database, these species are not expected to find adequate habitat conditions on the site, and are not likely to be present (see Appendix D for details).

Wildlife

The project site and the surrounding lands provide habitat for a wide variety of native animal species common to second-growth forests, successional shrublands, and palustrine wetlands of Puget Sound lowlands. Based on King County's Wildlife Habitat Profile (1987), field studies conducted for this EIS, and other sources, a list of species known to use the same types of habitats as those found on the Tukwila South site is included in Table B.1 of Appendix D. A variety of species were observed during field studies or are expected to occur in the habitats found on the project site, but not all of the species listed as regularly found in lowland habitats would necessarily inhabit the project site. Among the habitat types found on the site, the fewest species are expected to occur within the lowland grass/forb mowed cover type, and the most within the upland deciduous forest (see Table 5 in Appendix D). The following sections summarize wildlife species that may use the site (see Appendix D for details).

Reptiles and Amphibians

Most amphibians and reptiles are secretive and seldom observed, except during short periods in their life cycles. Consequently, distribution patterns, and specific habitat requirements for reptiles and amphibians are less well known than those of other Pacific Northwest vertebrate species.

Thirteen species of amphibians could use habitats on the project site. Of the amphibians likely to inhabit the site, two species were observed or detected during field surveys: Pacific tree frog and rough-skinned newt. The tree frog was found in all of the wetlands, as well as the ditches and streams and deciduous forest. A rough-skinned newt was found in Ditch E south of the golf driving range. Other species likely to occur onsite include some that require standing water for egg deposition (see Appendix D for a list of species). Inundated pools or troughs in Wetland 1, 5 and 13, and several of the ditches in the agricultural fields, likely support amphibian habitat.

Six species of reptiles, including lizards and snakes, and turtles are expected to occur in the types of habitats found on the site (see Table 5 in Appendix D for details).

Birds

The various habitats on the project site support numerous bird species. The exact number of species occurring onsite is unknown. However, based on field surveys and available literature,

141 bird species could use the types of habitats found onsite. Of this total, 33 bird species were detected during 2004 field visits. Not all expected species would be present during any given season, as some occur in the region only in the winter or spring, or during migration (see Table B.1 in Appendix D).

A few species of aquatic birds (i.e., herons, rails, shorebirds) could use the wetland habitats, particularly Wetland 10, during some time of the year. Great blue herons were observed foraging along the ditches in the southern portion of the site (see Other Priority Animal Species below).

A variety of waterfowl use the agricultural fields (i.e. corn stubble) on the site as winter forage. During site investigations (spring through summer), mallards and Canada geese were observed foraging in the corn and hay fields; these species could nest in the vicinity. Additional waterfowl species that could use the onsite agricultural fields during winter include green-winged teal, gadwall, and American and Eurasian wigeon. The ditches and wetlands in the lowlands could also be used as forage and refuge for waterfowl. King County lists a variety of waterfowl that would use the Green River offsite, such as the common merganser and common goldeneye. Remaining open space available to wintering waterfowl in the Kent/Auburn Valley is relatively limited and highly fragmented from past and ongoing development in the valley. Agricultural fields on the Tukwila South site (totaling approximately 70 to 80 acres) represent about one-quarter of the remaining crop production area, and from 10 to 15 percent of the remaining pasture and farmland combined within the valley. Although the onsite fields could harbor a significant number of waterfowl at times during the winter, the Tukwila South site is not listed on the Washington State Department of Fish and Wildlife (WDFW, 2004) Priority species and habitats (PHS) maps as a waterfowl concentration area. The nearest areas listed as concentration areas on PHS maps for waterfowl include small lakes south of Highway 18 (i.e., Lake Geneva and Lake Killarney); agricultural areas and other wetlands associated with the lower White River in Pierce County; pothole wetlands in the Milton/Puyallup areas; and, larger lakes, such as Lake Tapps (See Appendix D for details).

A variety of hawks and owls could use the site, and several species were observed. A number of individual red-tailed hawks were detected flying through the forested habitat and above the hillside in the western portion of the site. Four red-tailed hawk nest structures were observed in the forested habitats, although only one appeared to be active. This nest is located in a large cottonwood tree in the ravine south of the llama farm. Signs of nesting activity at this nest were observed during two 2004 site visits.

A peregrine falcon was observed flying along the ridgelines (see Endangered, Threatened and Sensitive Species below). American Kestrels (a falcon species) were observed over the small equipment yard east of the forested slopes and likely nest in the area. Kestrels typically nest in cavities in snags and forage in open areas, particularly agricultural fields. Several species of owls could use the habitats onsite, although owls were not observed during field surveys.

The band-tailed pigeon, a State game bird, is likely present on the site, although none were detected during site surveys (see Endangered, Threatened and Sensitive Species below). As many as five species of woodpeckers may be present on the site, four of which were detected during field surveys: the pileated and hairy woodpecker, red-breasted sapsucker, and northern flicker. Twenty-eight passerine species (perching birds) have been observed in the full range of habitats that occur on the site. Several aerial feeder species were observed feeding over the agricultural fields, and likely use the open canopy over the deciduous forest stands and

moderately vegetated areas as foraging habitat (see Appendix D for details). A number of species of granivores and frugivores (species that eat mainly seeds or fruits) were detected on the site. Most are year-round residents in the Puget Sound region (see Appendix D for a list of these species found on the site).

Mammals

The temperate forests and wetlands of the Puget Sound lowlands support a wide variety of mammals. They are less frequently observed than birds because of their often secretive and nocturnal habits. Fifty-two species of mammals are expected to inhabit the types of habitats found on the site during some part of the year (see Table B.1 of Appendix D). Of these, six species or their sign, including rabbit or hare, coyote, raccoon, river otter, Virginia opossum, and Douglas squirrel, were detected during field surveys.

The forest floor, with its relatively dense, low groundcover and scattered coarse woody debris, and the agricultural fields with tilled groundcover and crops, provides habitat for small mammals and carnivores. The most abundant are shrews, moles, rabbits, and small rodents. Small mammals are an important food source for the carnivores and predatory birds.

Small carnivores, such as skunks, weasels, and raccoons, are likely present onsite, as they are widespread in the lowlands of western Washington. These species are most common in wetland habitats and around lakes, streams, and rivers where they feed on small mammals, reptiles and amphibians, and prey on ground- and shrub-nesting birds.

Evidence of coyote was found in the llama farm and agricultural fields at the south end of the site. Coyote have become well adapted to more urbanized areas and are found within many suburban residential areas. The bobcat inhabits all habitats throughout Washington and could use the site, although no sign was evident. A river otter was observed running across an agriculture field and into a ditch south of S 204th Street during field surveys. Otters could nest along the banks of the Green River and use the ditches onsite to forage for food (amphibians, crustaceans, fish). Large game animals, such as the Columbia black-tailed deer, would be expected to use the habitats onsite, although no individuals or their signs were detected.

Endangered, Threatened, Sensitive, and Other Priority Animal Species

State priority species are defined as those fish and wildlife species "requiring protective measures and/or management guidelines to ensure their perpetuation" (WDFW; 1999). State priority habitats are defined as habitat types "with unique or significant value to many species" (WDFW; 1999). Maps show current documented locations and listings of priority species and habitats from the WDFW (2001, 2004) database.

Priority Habitats

Priority habitats mapped on the site include wetlands in the valley floor portion of the site; however, habitat maps depict wetlands that are general in terms of location and extent, and do not correspond exactly to actual wetlands delineated on the site. One of the mapped wetlands is depicted in the agricultural fields in the southern portion of the site (and also extends offsite to the south); portions of this wetland generally correspond to Wetlands 7, 8, 9, 10, and 11 delineated on the site. Another mapped wetland corresponds generally to Wetland 1 delineated

on the site. A third mapped wetland is shown farther north on the site in the location of the golf driving range and the lower portion of the llama farm; however, the only area found to have wetland (or stream) characteristics in this location during field studies conducted for this EIS was Stream E along the base of the forested slopes (see Section 3.4, Wetlands, for further discussion of these wetland areas).

A habitat area on the Washington State Department of Fish and Wildlife (WDFW; 2004) map depicts a bald eagle territory, a Priority Habitat, extending onto a portion of the project site and including an approximately 1.5 mile segment of the Green River (bald eagles are discussed further below).

See Fisheries below for a discussion of priority fish habitats on the site.

Endangered, Threatened, and Sensitive Species

With the exception of a bald eagle and species discussed under Fisheries below, no other wildlife species listed as threatened, endangered, or sensitive by federal or state agencies is documented by the WDFW (2004) on the site or immediate vicinity. Based on field surveys and background review of the site, the urban nature of the valley and fragmented forest habitats do not provide proper habitat for many of the endangered, threatened and sensitive species that may be present in western Washington, nor would they be expected to be found on the site. Following is a discussion of the listed species that have been observed or are likely to occur on the site.

Bald Eagle

The bald eagle is currently designated as threatened on both state and federal lists. Because of a significant increase in bald eagle populations in Washington, the State has proposed to reclassify the bald eagle as a sensitive species concurrent with the federal proposal for delisting of the eagle. The WDFW (2004) Priority Habitats and Species (PHS) map has documented a bald eagle nest near the north end of Angle Lake, over 2,000 feet west of the project site, along with the habitat area noted above. The nest was documented in 1999, but was not active during WDFW surveys in 2001; however, the WDFW (2004) map depicts a habitat area including a portion of the site. During field surveys in June 2004, no eagles were observed in the area near Angle Lake, nor were any potentially suitable nest trees found.

During one site visit, a bald eagle was observed flying over the northern end of the site toward the Green River. Bald eagles often prey on fish and waterfowl. Sightings in the vicinity would be expected because of the proximity of river and lake foraging areas and areas of waterfowl use, such as the agricultural fields onsite. Tall trees in the forested habitat may be used as perch or roost trees. No eagle nest trees are known to occur on the project site, nor were any found during field investigations.

The United States Fish and Wildlife Services (USFWS; 2004) lists wintering bald eagles as occurring in King County. Communal night roosts are an important component of bald eagle wintering habitat. Although some large potential communal roost trees were observed on the project site, no “winter concentration areas” or communal roosts are known to occur in the vicinity of the site (WDFW 2004).

Peregrine Falcon

The peregrine falcon is classified as a Federal species of Concern and a State sensitive species (WDFW 2004). Originally listed as federally endangered in 1970 and State endangered in 1980, the reclassification is based on the falcon's recovery to at least 73 pairs of nesting falcons in 2002. A peregrine falcon was observed flying parallel with the site along the western ridgeline during a March 2004, site visit. Peregrines could occasionally use the agricultural fields onsite for hunting waterfowl or shorebirds during the winter and may hunt along the Green River during spring months. Nesting habitat is not available onsite or in the vicinity, and WDFW maps do not document peregrine falcons in the area.

Other Priority Animal Species

The WDFW (1999) lists species as "Priority" for management and conservation other than those legally designated as endangered, threatened, and sensitive. State designations include candidate, monitor, and game species. Several of these species could be found on the site and are discussed below (see Appendix D for further detail).

State Candidate. State candidate species are those fish and wildlife species that "will be reviewed by the WDFW for possible listing as endangered, threatened, or sensitive according to the process and criteria defined in WAC-232-12-297" (WDFW 1999). The pileated woodpecker is listed as a State Candidate species (WDFW 2004). Pileated woodpecker foraging sign was seen in the mixed and deciduous forested stands on the hillside, and in Wetland 1 onsite. An older potential pileated woodpecker cavity was observed in a cottonwood snag within Wetland 1, but did not appear to be active. Other large snags potentially suitable as nest sites are widely scattered and few in number throughout the site; most snags onsite are too small and more decayed than generally used by this species for nesting. Large snags were observed in the forested ravine, south of the llama farm, near the top of the plateau. No other pileated woodpecker nest or roost cavities were observed or have been documented in the area (WDFW 2004).

The Vaux's swift may forage aerially over portions of the site, including over the tree canopy and wetland habitats. Large big-leaf maple trees with cavities were observed on the upper hillside near the cemetery, and large snags were seen in the forested ravine south of the llama farm. These trees may provide breeding sites for the Vaux's swift; however, swifts were not detected on the site during field surveys and the WDFW (2004) does not document swift breeding sites in the site vicinity.

State Monitor. Great blue herons, a state monitor species, may forage in the emergent and scrub-shrub wetlands, as well as the agricultural fields onsite, but they generally lack large areas of open water or emergent cover on the site. Great blue herons have been observed foraging along the ditches in the southern portion of the site. Herons could also use the large trees on the hillside as perching or roosting habitat. However, based on field surveys to date, no heron rookeries have been found or are known to occur on the site, nor are any known to occur in the site vicinity.

State Game. Priority game species are native species managed for game hunting that require protective measures and/or management guidelines to ensure their perpetuation. Four state game species of concern are expected to use habitats found on the project site or vicinity (King County 1987). These include the wood duck, band-tailed pigeon, mink, and Columbian black-

tailed deer. None of these species were observed during field surveys, although all could use the site. No "regular concentrations," as defined by WDFW (1999), are known on the site.

Heritage Points

Osprey are no longer designated as a priority species, but their nests are mapped as Heritage Points on the PHS database. Osprey and their nests are federally protected under the Migratory Bird Treaty Act of 1918 and protected by State law. The nearest known osprey nests are located approximately 1½ mile southeast, and 1½ mile northeast of the project site (WDFW 2004). Both nests are located on cellular towers; no information regarding the activity status of the nests is noted. Ospreys likely forage in the fish-bearing waters of the Green River near the site. However, suitable sites for nesting, larger snags or live trees with broken tops or suitable branches with views of the foraging area, were not observed on the site or along the stretch of the river that forms the eastern site boundary, and no osprey nests, or observations of osprey, were found during the site during surveys.

Wildlife Habitat Networks or Corridors

Wildlife habitat networks or corridors can take different forms, depending on the landscape. Corridors can be in the form of hedgerows or fencerows connecting woodlots in an agricultural landscape. In a fragmented forested landscape, corridors are linear patches of forest or forested riparian zones connecting larger patches of forest. They can also be non-forested linear patches, such as utility easements, or wetland and stream systems, in a landscape that is forested. In an urbanizing environment, such as the portion of King County where the site is located, open space or native forestland can act as corridors connecting otherwise disjunct habitat for wildlife species.

Corridors can provide: (1) habitat for certain species; (2) movement pathways; (3) extensions of foraging ranges for large, wide-ranging species; and (4) escape from predators. Corridors may also have disadvantages, such as (1) providing conduits for disease, fire, pests, and exotic species; (2) increasing exposure to predation; and, (3) potentially having negative genetic impacts on a population.

The forested hillside along the western half of the site provide a habitat and potential movement corridor for mammals, such as deer, coyote, and bobcat and other species adapted to closed-canopy forest. Riparian habitat along the ditches can act as a habitat corridor for smaller passerine birds. The ditch network in the southern portion of the site and its connection with the Green River and wetland/stream complexes are likely used by a variety of water-associated species.

Fisheries

On-site Fisheries Habitat Quality and Fish Use

Physical habitat attributes and fisheries use of on the site and in neighboring waterbodies are described below. Information on existing conditions was gathered from onsite investigations and previous studies (see Appendix E for details)

Physical Habitat Attributes

The City of Tukwila Zoning Code (December, 2004) defines streams or watercourses as follows:

> ***18.06.920 Watercourse -*** *"Watercourse" means a course or route formed by nature or modified by man, generally consisting of a channel with a bed and banks or sides substantially throughout its length along which surface water flows naturally other than the Green/Duwamish River. The channel or bed need not contain water year-round. Watercourses do not include irrigation ditches, stormwater runoff channels or devices, or other entirely artificial watercourses unless they are used by salmonids or to convey or pass through stream flows naturally occurring prior to construction of such devices.*

Watercourses in Tukwila are classified based on fish use and flow characteristics (TMC 18.45.100.A) as follows:

1. *Type 1 Watercourse: Watercourses inventoried as Shorelines of the State, under RCW 90.58. These watercourses shall be regulated under TMC 18.44, Shoreline Overlay.*
2. *Type 2 Watercourse: Those watercourses that have perennial (year-round) or intermittent flow and support salmonid fish use.*
3. *Type 3 Watercourse: Those watercourses that have perennial flows and are not used by salmonid fish.*
4. *Type 4 Watercourse: Those watercourses that have intermittent flows and are not used by salmonid fish.*

Habitat surveys conducted to evaluate existing conditions were completed during the fall of 2003, and winter, spring, and summer of 2004. All on-site channels were walked in their entirety, with the exception of Stream H, which would not be affected by the proposed actions (see description of Stream H below). During each survey, stream type was determined per 2004 City of Tukwila Municipal Code (TMC 18.45.100.A), habitat attributes were assessed, and fish presence/absence determined based on conservative assumptions of access and habitat quality (see Appendix E for details on these assumptions). If fish currently have, or have in the past had, access to a stream, and the stream contains suitable habitat based on depth (greater than about 1 inch at ordinary high water mark [OHWM]) and gradient (less than 25 percent), the reach was assumed to be fish bearing. The OHWM along all channels proposed to be impacted by the project was flagged and surveyed; the resultant data were used to calculate potential impacts from the Proposed Actions.

Twelve channels on the site meet the Tukwila definition of watercourses; two ditches do not meet the definition of a watercourse (A and B) (see Table 3.3-1). The watercourses are presented by drainage basin (see Section 3.2, Water Resources, including Figure 3.2-1**,** for further information on drainage basins). Table 3.3-1 is a summary of the watercourses, habitat attributes, and fish use on the project site. It should be noted that several of the watercourses identified as "streams" in this Plants and Animals - Fisheries section of the Draft EIS are labeled as ditches in other Draft EIS sections (i.e. Ditch E); several of the streams noted below are ditched streams, which indicates that the stream is a historic watercourse, now contained in a manmade channel.

Stream C. Stream C originates as groundwater discharged from a culvert immediately north of S 200th Street, near the toe of the valley wall (see Section 3.2, Water Resources, including Figure 3.2-1, for further information on this stream). Portions of Stream C, or the historic watercourse in this general location, likely carried natural flows at some point in the past, based on its location adjacent to the toe of the slope and source of perennial flows. The channel is connected to the confirmed fish-bearing waters of existing Johnson Ditch. No natural barriers to fish passage exist between existing Johnson Ditch and Stream C downstream of S 200th Street. As such, the watercourse is presumed to be fish bearing, and was classified as Type 2 per City of Tukwila's watercourse ratings system.

Stream D. Stream D originates from various sources in agricultural fields north and south of S 200th Street (see Section 3.2, Water Resources, including Figure 3.2-1, for further information on this stream). Portions of Stream D, or the historic watercourse in this general location, likely carried natural flows at some point in the past, based on its location in the floodplain. The channel is directly connected to the confirmed fish-bearing waters of existing Johnson Ditch. As such, the watercourse is presumed to be fish bearing, and was classified as Type 2 per City of Tukwila's watercourse rating system.

Stream E. Stream E is located in the northern drainage basin (see Section 3.2, Water Resources, including Figure 3.2-1, for further information on this stream). The portion of Stream E along the east-facing slope receives natural perennial flow from groundwater seeps on the slope (Streams E1, E2, and E3). While the watercourse is currently ditched and entirely artificial, parts of the channel could be relics of an historic watercourse that existed in the Green River floodplain prior to settlement of the area and diking of the mainstem river. The channel is currently isolated from fish-bearing waters, and no fish have been observed during past surveys by the City of Tukwila. Habitat is highly degraded due to occasional cleaning of the ditch and its current use as a livestock watering trough for part of its run. Water temperatures potentially lethal to salmonids (28.5 ^{o}C or 87 ^{o}F) have been recorded. However, due to the absence of confirming data to the contrary, the stream is considered fish-bearing and was classified as Type 2 per the City of Tukwila's watercourse rating system.

Stream E1. Stream E1 flows down the steep east-facing slope between I-5 and the driving range (see Section 3.2, Water Resources, including Figure 3.2-1, for further information on this stream). The natural stream is not considered fish bearing due to the very steep gradient of the channel, and was classified as Type 3 per the City of Tukwila's watercourse rating system.

Stream E2. Stream E2 flows down the steep east-facing slope between I-5 and the driving range about 400 feet north of Stream E1 and drains to Stream E (see Section 3.2, Water Resources, including Figure 3.2-1, for further information on this stream). Near Stream E2's confluence with Stream E, the gradient is less than 10 percent in some areas and could potentially harbor fish. The natural stream is not considered fish bearing due to the steep channel gradient and general lack of habitat, and was classified as Type 3 per the City of Tukwila's watercourse rating system.

Stream E3. Stream E3 emanates from Wetland 15 which in turn is fed by groundwater seeps on the east-facing slope east of I-5 (see Section 3.2, Water Resources, including Figure 3.2-1, for further information on this stream). Most of the stream flow travels via long culverts and drainage pipes to Stream E. The isolated channel pieces are very shallow (typically less than 1

Table 3.3-1
WATERCOURSES, HABITAT ATTRIBUTES, AND FISH USE ONSITE[a]

Watercourse Name	Type of Water[b]	Tukwila Type	Fish Use	Avg. Slope	Dominant Substrate	Flow
NORTHERN BASIN						
Stream E	Ditched stream	2	Assumed fish-bearing	0.1%	Silt/organic	Perennial
Stream E1	Stream	3	None; isolated and steep	35%	Gravel	Perennial
Stream E2	Stream	3	None; isolated and steep	25%	Gravel	Perennial
Stream E3	Stream	3	None; isolated, poor habitat	20%	Gravel	Perennial
Stream H	Stream	3	None; isolated and steep	35%	Gravel	Perennial
CENTRAL BASIN						
Stream G	Stream	3	None; isolated and steep	25%	Gravel/silt	Perennial
SOUTHERN BASIN						
Ditch A	Ditch	None[c]	None; isolated, no habitat	10%	Quarry spalls	Intermittent
Ditch B	Ditch	None[c]	None; isolated, no habitat	8%	Dirt	Intermittent
Stream C	Ditched stream	2	Assumed fish-bearing	0.1%	Organic	Perennial
Stream D	Ditched stream	2	Assumed fish-bearing	0.1%	Silt/organic	Perennial
Existing Johnson Ditch – East Fork	Ditched stream	2	Fish-bearing	0.1%	Silt/organic	Perennial
Existing Johnson Ditch	Ditched stream	2	Fish-bearing	0.1%	Silt/organic	Perennial
Ditch J1	Ditch	2	Assumed fish-bearing	0.1%	Silt/organic	Intermittent
Stream J2	Stream	2	Assumed fish-bearing	2%	Silt/organic	Perennial

Source: Cedarock, 2005.

[a] A fourth basin (Northeast) exists on the site; however, it contains no watercourses

b Watercourse – any channel meeting the City of Tukwila Zoning Code watercourse definition (TMC 18.06.920)
Stream – historic watercourse in a natural channel
Ditched Stream – historic watercourse in a manmade channel
Ditch – manmade channel or watercourse with no evidence of an historic basis

[c] Does not meet the definition of a natural watercourse under the TMC 18.06.920

inch deep) and 1 to 3 feet wide. The natural stream is not considered fish bearing due to its long-term isolation from fish-bearing waters and general lack of habitat, and was classified as Type 3 per the City of Tukwila's watercourse rating system.

Stream G. Stream G, located in the central basin, consists of a natural but isolated 400-foot-long channel running down the steep east-facing slope, east of where Orillia Road passes under I-5 (see Section 3.2, Water Resources, including Figure 3.2-1, for further information on this stream). The stream is not considered fish bearing due to its long-term isolation from fish-bearing waters, steepness, and general lack of habitat, and was classified as Type 3 per the City of Tukwila's watercourse rating system.

Stream H. Stream H, located in the northern basin, consists of a natural but isolated 600-foot-long channel running down the steep northeast-facing slope behind the Levitz building on Southcenter Parkway (see Section 3.2, Water Resources, including Figure 3.2-1, for further information on this stream). The stream is not considered fish bearing due to its long-term isolation from fish-bearing waters, steepness, and general lack of habitat, and was classified as Type 3 per the City of Tukwila's watercourse rating system.

Johnson Ditch. Existing Johnson Ditch (WRIA 09-0038), in the southern basin of the project site, is currently maintained by King County Drainage District #2 as an agricultural drainage ditch (see Section 3.2, Water Resources, including Figure 3.2-1, for further information on this ditch). The ditch discharges to the Green River via a piped outfall near RM 17.4. The outfall has been fitted with a flood gate to prevent flooding. The gate is often blocked by debris or vandalized to a partially open position and fish are believed to migrate upstream into the ditch under some flow conditions. Both King County and Washington State Department of Fish and Wildlife (WDFW) biologists have reportedly observed salmonids in the stream). Existing Johnson Ditch was classified as Type 2 per the City of Tukwila's watercourse rating system. No habitat suitable for spawning was observed in existing Johnson Ditch, although the reach provides medium quality winter and summer rearing opportunities in shallow runs and pools. The presence of riparian vegetation depends on the last time the ditch was cleaned and dredged.

The East Fork of existing Johnson Ditch is directly connected to existing Johnson Ditch and likely has a similar population of fish during the winter. Therefore, it was classified as Type 2 per the City of Tukwila's watercourse rating system.

Ditch J1. Ditch J1 is a straight, manmade agricultural ditch tributary to existing Johnson Ditch (see Section 3.2, Water Resources, including Figure 3.2-1, for further information on this stream). The ditch was dug and is maintained to carry drainage form Wetland 10 away form downslope croplands. Ditch J1 is directly connected to Johnson Ditch, and it is likely that any fish in that watercourse would also use portions of Stream J1 during the winter. Based on the potential for fish use, the ditch was classified as Type 2 per the City of Tukwila's watercourse rating system.

Stream J2. Stream J2 is a highly disturbed natural watercourse that meanders across the southwestern portion of the site, east of Orillia Road and north of S 204th Street (see Section 3.2, Water Resources, including Figure 3.2-1, for further information on this stream). Flow in the stream is believed to be perennial, and it is possible that fish may access the creek on occasion during the winter when water depths provide suitable conditions; therefore, Stream J2 was classified as Type 2 per the City of Tukwila's watercourse rating system.

Ditch A. Ditch A is a short section of manmade ditch located in the southern portion of the project site on the hillside immediately north of S 200th Street (see Section 3.2, Water Resources, including Figure 3.2-1, for further information on this stream). It is in an area that was disturbed during past operations at the adjacent gravel mine. It is doubtful any watercourse in this area historically contained flows, as the entire area was excavated and refilled during past quarry operations. Stream A flows only intermittently, is quarry-spall lined, and contains no habitat suitable for fish. It is considered non-fish bearing and is not believed to meet the criteria of a watercourse under the City's code.

Ditch B. Ditch B and its various side channels are located on the hillside containing the old gravel mine (see Section 3.2, Water Resources, including Figure 3.2-1, for further information on this stream). These channels are all manmade, created following activities at the quarry to carry runoff from the disturbed soils. Ditch B has intermittent flows, is dirt and quarry-spall lined, and contains no habitat suitable for fish. It is considered non-fish bearing and is not believed to meet the criteria of a watercourse under the City's code.

On-site Fish Use

Few fish surveys have specifically targeted the project site. No salmon or trout were recorded in surveys by City of Tukwila (1990) or the applicant (2000), although agency habitat biologists from King County and WDFW have reportedly observed salmonids in existing Johnson Ditch in the past. Electrofishing surveys by the applicant have recorded observations of threespine stickleback and sculpin (2000). It is likely that salmonids occasionally access Johnson Ditch and its tributaries during suitable flows when the flood gate is stuck open. Existing Johnson Ditch, tributaries to Johnson Ditch, and Stream E are assumed to be fish-bearing.

Off-site Waterbodies and Fish Use

This section provides a description of the physical habitat attributes and fisheries use of offsite waterbodies receiving flow from the project site. The only potentially affected waterbody is the Green River. The project site is located adjacent to the Green River between approximately RM 15.0 and RM 17.5 (see Section 3.2, Water Resources, including Figure 3.2-1, for further information on this river).

Green River Fish Use

Chinook, coho, chum, pink, and sockeye salmon; steelhead; and coastal cutthroat trout are currently found at various times of the year in the Green River (see Table 3 in Appendix E for details). Native char may be present, although they are not considered likely. Native resident salmonids include rainbow and cutthroat trout and mountain whitefish. Other native resident fish species are also present, including lamprey and various minnow, sculpin, and sucker species.

Chinook Salmon. Chinook salmon within the Green/Duwamish River basin originate from both native and hatchery fish. The stock is of mixed origin, as natural production is currently supplemented by hatchery releases from the Green River Hatchery located on Soos Creek. Most Chinook Salmon in the Green River system are summer/fall run fish. Chinook in the Green River are part of the Puget Sound Evolutionarily Significant Unit (ESU) currently listed by the National Marine Fisheries Service (NMFS) as threatened under the Endangered Species Act (ESA). Both Green River Chinook stocks are listed as healthy by the Washington State Department of Fish and Wildlife (WDFW) (see Appendix E for additional information).

Coho Salmon. Green River coho salmon within the Green/Duwamish River basin are part of the greater Puget Sound/Strait of Georgia ESU considered by NMFS to be a candidate for listing under the ESA. Coho salmon in the Green River system are divided into the Soos and Newaukum Creek stocks. Both stocks are of mixed origin and contain both native and non-native coho. The Newaukum Creek stock is considered depressed, and the Soos Creek stock is currently considered healthy (see Appendix E for additional information).

Chum Salmon. Two chum salmon stocks are recognized in the Green River system. The Green/Duwamish stock may be a remnant native stock, but its status is considered unknown by WDFW due to insufficient data. The Crisp Creek fall chum stock originated from releases of Quilcene and Hood Canal stocks in the early 1980s and is considered healthy by WDFW (see Appendix E for additional information).

Pink Salmon. Not much is know about the distribution of pink salmon in the Green River. The Puget Sound pink salmon stock is considered by NMFS to be healthy and not at risk of extinction. No Duwamish/Green River pink salmon stock is recognized by WDFW (see Appendix E for additional information).

Sockeye Salmon. Sockeye salmon exhibit a variety of life-history types including freshwater (kokanee), lacustrine (lake–rearing) sockeye, and river-type sockeye. Lake-rearing stocks represent the most common and typical life history. Sockeye that rear in rivers for 1 to 2 years (river-type sockeye) are less common and little is known about them. The Green River possesses river-type sockeye in very low numbers. Only between 100 and 400 are reported annually near the Headworks Dam. The origin of adult sockeye observed spawning in the Green/Duwamish river basin is not known. It is hypothesized that the fish may either be strays from other populations, a riverine form of sockeye, or some combination of both (see Appendix E for additional information).

Steelhead and Rainbow Trout. Steelhead and rainbow trout represent different life histories of the same species of salmonid. Steelhead migrate to saltwater after spawning in freshwater (anadromous), but rainbow trout spend their entire life in freshwater. Two major run types, winter and summer steelhead, are found in the Green/Duwamish river basin. Resident rainbow trout spend their entire lives in freshwater wherever deep, cool water with high oxygen content can be found. Green/Duwamish River steelhead are part of the Puget Sound ESU. The Puget Sound steelhead stock is considered by NMFS not to be at risk of extinction. Both the summer and winter Green/Duwamish River steelhead stocks are listed as healthy by the WDFW (see Appendix E for additional information).

Cutthroat Trout. Resident life history forms of cutthroat trout are present throughout all perennial reaches of the Green River drainage. Anadromous fish are believed present through all accessible reaches of the system. The population of coastal cutthroat trout in the Green/Duwamish River system is small and has not been well studied. Less than 50 are caught by anglers each year. It is considered to be native and the population is maintained through wild production. The stock status is labeled unknown by WDFW due to insufficient data. The Green/Duwamish River coastal cutthroat trout population is part of the Puget Sound ESU. The Puget Sound ESU does not warrant listing under the federal ESA, as populations have been fairly stable over the past 10 to 15 years (see Appendix E for additional information).

Native Char. Bull trout and Dolly Varden are native char, typically found in high mountain streams or near cold perennial springs, although individual fish can occur downstream

throughout larger river systems. Bull trout generally live in freshwater their entire lives, although a small component of the Puget Sound run is anadromous. Dolly Varden are generally anadromous. Self-sustaining bull trout populations in the Green/Duwamish River Basin have not been documented, although individual fish have been observed.

Bull trout were historically found in the lower Green River, but have not been recently documented. Their presence is considered "possible but not likely." Any bull trout found in the Green/Duwamish River are part of the Puget Sound bull trout Distinct Population Segment (DPS) identified by the United States Fish and Wildlife Service (USFWS). All bull trout in the coterminous United States are listed as threatened under the ESA by the USFWS. Dolly Varden are proposed for listing as threatened due to their similarity in appearance to bull trout. The stock status is labeled unknown according to WDFW (1998) due to insufficient data (see Appendix E for additional information).

Barriers to Fish Migration

No barriers to fish migration exist downstream of the project site in the Green River. However, the Green River levee currently presents a significant barrier to fish movement upstream from the river onto the project site (see Figures 5, 6 and 7 of Appendix E). Water from the site drains via four outfalls to the Green River, all of which are protected from backwater flooding by flood gates (see Figures 5, 6 and 7 of Appendix E). Flood gates typically prevent fish from moving upstream by either being closed when the Green River is high, or by the combination of partial closure and high water velocities at the mouth when the Green River is lower. Two of the outfalls in the northern and central portions of the site are connected to a long (1,000 plus feet) stormwater control system through which no fish are known to pass. The southern outfall drains from existing Johnson Ditch and is occasionally blocked open. Fish are believed to periodically be able to pass upstream through this outfall.

Fish Stranding

Historically (within the last few hundred years), the project site consisted of a mix of very low gradient fringing wetlands and alluvial deposits. Juvenile salmonids used portions of the site as off-channel rearing during high flow events as the wetlands flooded. When the area was settled in the early 1900s, channels were dug through the wetlands to drain the water and carry hillside spring flow directly to the Green River. Levees were eventually built between the site and the Green River to prevent flooding from the Green River. As a result, fish use of the site was drastically curtailed.

Under pre-European settlement conditions, it is likely that both anadromous and resident fish stranding occurred in the wetlands on occasion. While most fish likely escaped during receding water levels, those fish that had moved deep into the wetlands and surrounding floodplains might have become trapped. Stranding is natural and inevitable with the large amount of complex habitat adjacent to a major river. As the area was settled and the wetlands cleared, drained and converted to agricultural fields, stranding continued to occur. Stranding is periodically reported in numerous areas in the Green River Valley, especially where the levees are less prevalent than adjacent to the project site. Stranding is uncommon on the site under existing conditions due to the poor access currently afforded fish.

Federally Protected Fish Species

Two fish species listed as threatened under the federal Endangered Species Act and one fish species proposed for listing could potentially be directly or indirectly affected by Alternatives 1 and 2 and the No Action Alternative. The listed species are Chinook salmon and bull trout. The Dolly Varden is proposed for listing because of its similarity of appearance to bull trout. In addition, Chinook, coho, and pink salmon habitat has been designated Essential Fish Habitat (EFH) by the Pacific Fisheries Management Council. Descriptions of the life history and occurrence of these fish species in the site vicinity are provided in Section 2.5 of Appendix E.

Sensitive Area Master Plan

The City of Tukwila has adopted amendments in 2004 to its Sensitive Areas Ordinance (SAO) that would provide for designation of Sensitive Area Master Plan overlays and preparation of Sensitive Area Master Plans in situations where a comprehensive plan for alteration and mitigation would result in net environmental benefits and under certain conditions. The Sensitive Area Master Plan overlays are intended to give special consideration to conservation or protection measures necessary to preserve or enhance anadromous fisheries (see Chapter 2 for further discussion).

3.3.2 Impacts

Alternatives 1 and 2

Under Alternatives 1 and 2, during full buildout, developed areas would encompass approximately 75 percent of the site, and would include business campus, retail/commercial, and residential uses, and arterial (Southcenter Parkway and S 178th Street) and onsite roads. Conversely, open space areas, including restored, rehabilitated and retained wetlands and stream habitats, steep slopes, and other undeveloped open space, would encompass approximately 20 percent of the site. Of this open space area, approximately one-third would comprise the proposed wetland rehabilitation area and Green River Off-Channel Habitat Restoration Area on the valley floor. The remainder of the open space would encompass wetlands, steep slopes, and other open space on the forested hillside. An additional amount of open space (landscaped area and stormwater control features) would be provided within the developed areas of the site (up to approximately 5 percent of the site).

The conversion of approximately 75 percent of the site to a mix of uses would begin during the infrastructure development phase, during which mass grading and site preparation would occur. Following this phase, long-term development of the site would convert cleared areas to building, road and parking areas, including associated landscaped areas. Nearly all of the substantive impacts to plant and animal communities, that would be expected under Alternatives 1 and 2, would occur as a result of the infrastructure development phase.

Infrastructure Development Phase

Areas to be developed under either Alternative 1 or 2 would be cleared and would undergo initial grading to establish subgrade elevations during the infrastructure development phase. Infrastructure improvements would be installed during this phase as well (see Chapter 2 and Appendix B, for additional information).

Plant Communities

Infrastructure development under either Alternative 1 or 2 would initiate the conversion of a significant portion of the existing undeveloped area of the site to a mix of uses. Except for the wetland rehabilitation, Johnson Creek restoration, and Green River Off-Channel Habitat Restoration Areas, nearly all of the agricultural fields, as well as the farm and the golf driving range, would be cleared during the infrastructure development phase. Portions of the forested slopes would also be cleared for ultimate conversion to urban development. This would include most of the conifer forest and early successional shrub areas, as well as shrubland areas and portions of the deciduous and mixed forest habitats.

Under either Alternative 1 or 2, 9.45 acres of wetland would be filled. The majority of this acreage is currently used as agricultural cropland. Other wetlands to be filled include several small, closed depressions, portions of Stream E (considered a regulatory wetland) to be crossed by the extension and expansion of Southcenter Parkway, and a sloping, forested wetland (Wetland 16) in the northern portion of the site. Mitigation for the loss or alteration of wetland habitat from the proposed development would be provided through wetland rehabilitation as required by the City of Tukwila, Washington Department of Ecology, and the U.S. Army Corps of Engineers. See Section 3.4, Wetlands, and Appendix F for further discussion of wetland impacts and mitigation.

The majority of the forested hillside, including steep (greater than 40 percent) slopes, wetlands, streams, and their buffers, would be retained under Alternatives 1 or 2. This includes over 80 percent of the existing wetland acreage on site. The retained open space areas also include most of the deciduous and mixed forest habitats on the western portion of the site.

Clearing and mass grading of the site would increase the degree of fragmentation of existing natural habitats onsite to some degree, particularly at the southern end of the site, just north of S 200th Street. Under either Alternative 1 or 2, portions of the forest and shrubland would be replaced with cleared areas, and some impervious surfaces (i.e., the extension and expansion of Southcenter Parkway and the S 178th Street realignment).

Clearing of areas to be developed in the future would increase the amount of edge habitat that borders urban development. However, the existing forested habitat on or adjacent to the western boundary of the site is already bisected by arterial roads, such as Orillia Road, as well as several existing rural residential lots and other uses. In addition, the shrubland area near S 200th Street (in the former gravel mine area) is dominated by shrubs and tree saplings that have developed since the mining was completed and the area was re-graded.

Initial infrastructure development, including site grading, would create artificial edges between retained vegetation communities and cleared, graded areas. Initially, the cleared areas would consist of bare ground, on which grasses would be seeded to stabilize soils until development occurs. Depending on the length of time these areas remain undeveloped, the density and diversity of herbaceous plants may increase. In addition, weedy or exotic invasive species and herbaceous plants adapted to disturbed conditions could become established, and some of these could further invade retained native communities. However, some of these species are already present in the edges of the forest stands and other open spaces on site, and, as many invasive or weedy species are adapted to open or disturbed conditions, the density of retained native forest would limit their ability to invade these areas.

Additional changes to vegetation communities on site would occur during the infrastructure development phase. These would occur within the wetland rehabilitation areas, as well as the Green River Off-Channel Habitat Restoration Area. As part of the habitat mitigation plan, 32.43 acres of degraded pasture wetland on-site would be rehabilitated by improving existing hydrology and re-establishing wetland habitats consisting primarily of palustrine, forested and scrub-shrub cover in the southwestern portion of the site. The rehabilitated wetland would provide diverse, contiguous aquatic habitat connected to a restored Johnson Creek stream channel. A portion of the Green River flood control levee north of the S 200th Street Bridge would be relocated inland to provide flood storage and to create additional fish habitat in an approximately 7-acre area, including approximately 700 feet of river bank, immediately adjacent to the river. The existing linear Johnson Ditch would be restored and relocated as a stream with natural meanders, terraced floodplain, woody debris, and native riparian plantings.

Impacts on Endangered, Threatened, Sensitive, and Other Priority Species

No endangered, threatened, or sensitive plant species are known or are likely to occur onsite. Consequently, neither Alternative 1 nor 2 would adversely impact such species.

Wildlife

Infrastructure development under either Alternative 1 or 2 would eliminate some of the forested and shrubland habitat available for native wildlife. This would reduce the local populations of most remaining native species, and cause a number of incremental changes in the species composition. For example, changes in bird communities include increased abundance of non-native and habitat generalist species, and decreased species richness, sometimes accompanied by an increase in overall bird density. Structural simplification of habitats, favoring non-native species, could occur; however, structurally simplified habitats are already in evidence in the portions of the site that are already highly managed (i.e., for agricultural crops, hay production, and keeping of livestock, such as llamas). Urban-adapted species could displace or eliminate native wildlife, or significantly affect breeding or nesting success on the site. However, urban-adapted species are already present in altered portions of the site, including agricultural areas and the existing Segale Business Park, and likely already affect remaining native wildlife in the forested hillside.

Short-term impacts to wildlife would include disturbance associated with clearing, grading, and construction activities from infrastructure development. Animals that are least tolerant of human disturbance, such as ground- and shrub-nesting birds, small, ground-dwelling mammals, carnivores, and amphibians, are typically most affected by such construction. However, many of these species likely have already been adversely affected by the long history of human alteration of the site.

Potential human-disturbance related impacts to wildlife in retained wetlands and uplands include those related to increased light and noise level associated with infrastructure development. The infrastructure development phase could include lighting during early morning and late afternoon or evening hours for construction that would occur during winter months (see Section 3.11, Aesthetics, for a discussion of light and glare impacts during infrastructure development). Construction activities could add some lighting to areas near retained wetlands and native forest stands on site, and adjacent areas offsite, such as the horse farm to the south. Some increases in noise levels would also be expected with construction during infrastructure development (see Appendix K and Section 3.14, Noise, of the DEIS). Noise from construction-related activities

could temporarily displace animals from retained wetland and upland areas onsite. Construction noises are expected to be intermittent and irregular in frequency and would not be expected to result in significant impacts to wildlife.

Wildlife movements among available habitats would be affected to some degree. However, under current conditions, forested habitats are bisected or are separated from off-site forests by existing roads. These roads can act as movement barriers to many species, particularly ground-dwelling species, or those averse to crossing open areas. Movements of other species, such as many birds, may be less affected. Clearing and conversion of some of the forest and shrub habitat would decrease the area of native forest adjacent to offsite habitats, which would incrementally reduce potential avenues of movement. Clearing and conversion of existing open space areas (such as agricultural fields) could also reduce potential avenues of movement for other species. However, given the industrial uses already present on the site and within the site vicinity, movement of wildlife between offsite and onsite habitats is already impaired.

Populations of reptiles and amphibians, which rely on forest duff, downed logs, snags, and wetlands, would likely be somewhat reduced overall on the Tukwila South site. Those that live in the upland forests would remain in the retained forest stands, but the overall populations would likely decrease. The majority of wetlands and streams on the site would remain intact or undergo rehabilitation to enhance habitat value; however, other special habitat features and much local dispersal habitat, either wetland or non-wetland (areas to which young move from where they are born or reared), would be eliminated.

The net loss of wetland acreage onsite would have an impact on habitat for some wetland-adapted species. In particular, the winter foraging habitat for some waterfowl species, such as Canada geese, mallards, teal and wigeon, or the winter and early-spring habitat for killdeer provided by the fallow agricultural fields (both wetland and non-wetland) would be eliminated under either Alternative 1 or 2. As discussed previously, winter foraging habitat for waterfowl is relatively limited in the Green River Valley, and development of this site would reduce such habitat on an incremental basis. Temporary impacts to the pasture habitat south of S 204th Street would occur as the wetland mitigation area is graded and planted. As the mitigation site develops, it is expected to provide habitat for many species, including songbirds, hawks, small mammals, amphibians, and reptiles.

However, it should be noted that most of the on-site agricultural fields occur within the wildlife hazard zone around Seattle-Tacoma International Airport (see Figure 3 of Appendix D). The Federal Aviation Administration (FAA) establishes a hazard zone within 10,000 feet of public-use airports, in which land uses considered to have the potential to attract wildlife hazardous to air traffic (such as geese or similar large birds) are to be discouraged. The existing cornfields, particularly those that are seasonally wet, are an example of an attractant for wildlife considered hazardous.

Additionally, much of the wetland acreage that would be eliminated is currently managed for corn production, which includes periodic use of herbicides. Therefore, these wetland areas currently have little or no habitat value for many other native species, including amphibians, many birds, and mammals. Implementation of the proposed wetland rehabilitation during the infrastructure development phase is expected to enhance habitat value over time for many species, as compared with current conditions. The proposed wetland mitigation would include establishment of a mosaic of tree and shrub cover where there currently is none. Additional

features would include downed woody debris and snags. These features are expected to provide habitat for a variety of songbirds, hawks, small mammals, amphibians, and reptiles.

Impacts on Endangered, Threatened, Sensitive, and Other Priority Species

Endangered, Threatened, and Sensitive Species. Infrastructure development is not expected to affect endangered, threatened, or sensitive animal species, as none have been documented on the site, and potential habitat is either lacking or very limited. Although bald eagles, a state and federal threatened species, have been observed on or over the site on occasion, no nest sites are known to occur on or in close proximity to the site.

The site is shown within the potential home range of an eagle nest site near Angle Lake. The majority of the potential perching or roosting habitat on the forested slopes would be retained under either Alternative 1 or 2. Some winter foraging habitat of potential prey species (i.e., waterfowl) would be eliminated with loss of the agricultural fields during infrastructure development. However, the potential foraging habitat of the Green River (as a fish-bearing water and waterfowl habitat) would remain. Thus, while most of the site lacks suitable habitat for eagles, most of the habitat features onsite or in the vicinity potentially used by eagles would remain. Again, as noted above, continued use of the agricultural fields by waterfowl (or enhancement of their habitat) on most of the site is not compatible with the wildlife hazard zone around SeaTac airport.

As discussed above, peregrine falcons also have been observed flying over the site on occasion. However, no nest sites are known to occur on site or in the vicinity, and available habitat for potential prey species (waterfowl and shorebirds) is relatively limited (no known "concentration areas"). Consequently, no adverse impacts to peregrine habitat in the vicinity of the project site are anticipated with infrastructure development. No other endangered, threatened, or sensitive animal species would be adversely affected by either Alternatives 1 or 2, because none are known or likely to inhabit the site.

Other Priority Species. The loss of a portion of native forest on the site with infrastructure development under either Alternative 1 or 2 would further reduce the amount of potential habitat available in the general vicinity for pileated woodpeckers (a State candidate species). However, most of the potential habitat for pileated woodpeckers onsite would be retained. Although large snags for nesting and foraging are relatively limited, most of the forested areas in which they are located would be retained within open space areas. No active nest trees are known to occur on the site or in the site vicinity. Thus, most of the potential habitat for pileated woodpeckers on site would be retained.

State Monitor species, such as the osprey, would likely be unaffected by the proposed infrastructure construction, or future development, as no nesting or foraging habitat has been documented onsite. Great blue herons, another Monitor species, could find some foraging habitat in some of the wetland areas within the agricultural fields. Most of this area would be eliminated, but other foraging areas would be retained or enhanced in the mitigation areas onsite (which would be graded and planted during the infrastructure development phase), and other, more suitable foraging habitat is available in the vicinity (e.g., the rehabilitated wetland areas associated with the old Kent sewage lagoons to the southeast).

Fisheries

As discussed under Affected Environment, salmonid use of the site likely includes occasional use of existing Johnson Ditch and its tributaries during suitable flows when the flood gate at the outfall to the Green River is stuck open. Offsite, salmonids use the Green River. Following is an evaluation of potential impacts to fisheries resources from infrastructure development, including possible effects on local fish and fish habitat.

The capacity of freshwater streams to support a population of salmonid fishes is most often a function of the quality and quantity of habitat conditions for critical life history stages of the important species. Factors related to land development that influence habitat conditions are generally associated with: (1) physical loss or degradation of habitat features resulting from structures being directly built within the active channel, adjacent riparian area, or potential channel migration zone; (2) the change in delivery of fine and coarse sediments from disturbed surfaces; (3) impacts to the functionality of riparian zones; (4) effects on water quality; and, (5) changes in water quantity. The influence of each of these factors on fish habitat and related existing site conditions is discussed below.

Direct Impacts

Direct impacts to fish habitat are most likely to occur when construction activities take place at or below the Ordinary High Water Mark (OHWM) in a stream, side-channel, or associated open water wetland. Construction within flowing wetlands or streams greatly increases the chance of erosion and sediment transport downstream and makes it more difficult to adequately protect water quality from other effects, such as contaminant spills. Construction within or near non-fish-bearing streams can eliminate nutrient input, primary productivity, and macro-invertebrate production, which contribute to the productivity of fish populations downstream.

Infrastructure development under Alternative 1 or 2 would include a number of actions that would directly impact potential fish-bearing streams, including: filling of all or portions of five watercourses for the Southcenter Parkway extension, the relocation of the flood protection barrier dike, stormwater ponds and mass grading operations; reconfiguring the Green River levee at the Off-Channel Habitat Restoration Area; installation of the new stormwater discharge culvert and outfall to the Green River; installation of the new Johnson Creek outfall to the Green River; installation of a temporary culvert within existing Johnson Ditch to allow construction of the relocated flood protection barrier dike; and, use of the temporary haul road from the Green River Off-Channel Habitat Restoration area under S 200th Street (refer to Chapter 2 and Appendix B of this Draft EIS for details on these infrastructure elements). Proposed construction impacts are highlighted in Table 3.3-2, depicted in Figure 3.3-2, and summarized in greater detail in Appendices C and E.

A total of 7,127 linear feet (1.35 miles) of five watercourses would be filled. Under existing conditions, all watercourses proposed to be filled are linear manmade drainage ditches created primarily for agricultural purposes. Except for Stream D, all channels carry natural flow from hillside seeps to the Green River. Stream D was created to drain winter runoff and the high water table flow from agricultural fields. All five of these watercourses are presumed to be fish-bearing, although habitat quality is generally very poor.

Table 3.3-2
INFRASTRUCTURE DEVELOPMENT IMPACTS TO STREAMS

Stream	Linear Impact (feet)			Area Impact (acres)		
	Southcenter Parkway Extension	Other Infrastructure Development	Total	Southcenter Parkway Extension	Other Infrastructure Development	Total
Johnson	0	1,346	1,346	0	0.30	0.30
C	0	852	852	0	0.10	0.10
D	0	1,247	1,247	0	0.21	0.21
E	2,698	109	2,807	0.41[a]	0.01	0.42
J-1	0	875	875	0	0.04	0.04
Total	2,698	4,429	7,127	0.41	0.66	1.07

Source: Cedarock Consultants, 2005.
[a] Impacts assume a 20-foot construction impact zone beyond grading limits. Actual impact area may be less.

It is assumed that under terms of the Hydraulic Project Approval (HPA) required by the Washington Department of Fish and Wildlife (WDFW) for hydraulic actions, the following measures would be taken prior to activities in or near potential fish-bearing streams: creeks would be blocked off and any fish relocated to downstream locations prior to filling; hillside drainage would be intercepted and pumped around the work areas to undisturbed reaches of channel downstream of the work area; the groundwater table would be lowered by pumping (outflow directed to the Green River); and, temporary erosion and sedimentation control (TESC) measures would be implemented as necessary. If any fish are present in the ditches, it is possible that not all of them would be recovered prior to filling. Therefore, it is possible that a low level of fish mortality could occur. The loss of available summer rearing habitat would not critically interrupt the life cycle of any fish population. Overall, direct impacts to fisheries resources are not expected to be significant, because of the low levels of existing fish use in the affected waters and site conditions conducive to successful implementation of typical TESC measures (i.e., low gradient slopes).

Construction of the Green River Off-Channel Habitat Restoration Area would include implementation of TESC best management practices (BMPs) to prevent erosion and sedimentation and water quality impacts to Green River fish habitat. All water quality standards and conditions of approval for the in-water work would be followed. Instream work would be performed during August when it has the least potential for impact to salmonid fishes, including Chinook salmon and bull trout. Additionally, the Green River would be screened from noise and visual disturbances of construction truck traffic by a solid concrete bridge abutment between the haul route and the Ordinary High Water Mark (OHWM). Construction of the new Johnson Creek would also include TESC BMP mitigation measures. The new creek channel and associated riparian area would be excavated in the dry (non-flooded) condition; fish would be relocated from the existing Johnson Ditch to the new channel in late summer (see Appendix E for further detail).

With proposed TESC BMPs and standard WDFW measures used to remove any fish from affected stream channels, significant adverse effects on fisheries resources would not be anticipated from infrastructure development under Alternatives 1 and 2.

KEY

Project perimeter

Existing wetlands

Impacted wetlands

Impacted buffers

Existing watercourses

Impacted watercourses

Andover Park W

Segale Park D Dr.

Segale Park B Dr.

Segale Park C Dr.

S. 180th St.

S. 180TH ST. PUMP STATION TO GREEN RIVER

CULVERT

STREAM E (DITCHED STREAM)

CULVERT

PIPE

STREAM E (DITCHED STREAM)

WL #16

PIPE

STREAM E-3

STREAM H

S. 178th St.

WL #15

WL #14

CULVERT

STREAM E (DITCHED STREAM)

STREAM E1

PIPES TO GREEN RIVER

WL #4

STREAM G

WL #18

WL #17

STREAM E2

PIPE

Buffer Impact

WL #2

WL #1

PIPE TO GREEN RIVER

WL #6

PIPE TO GREEN RIVER

JOHNSON DITCH (DITCHED STREAM)

S. 204th St.

S. 200TH ST. PIPE DRAINAGE COLECTION

WL #3-A

WL #5

S. 200th St.

CULVERT

WL #7

WL #4-A

STREAM C (DITCHED STREAM)

WL #8

WL #9

STREAM D (DITCHED STREAM)

CULVERT

CULVERT

Orillia Road

WL #3

WL #13

DITCH A UNREGULATED

DITCH B UNREGULATED

DITCH J-1 (REGULATED)

WL #10

JOHNSON DITCH (DITCHED STREAM) (EAST FORK)

STREAM J-2

JOHNSON DITCH (DITCHED STREAM) (WEST FORK)

WL #11

NORTH

Scale: 1"= 800'

0 400' 800'

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RAI# 2001-014-004

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Figure 3.3-2
Wetland and Watercourse Impacts

Tukwila South Project EIS

Sediment Recruitment Impacts

A second risk to fish habitat resulting from construction activities is the potential for fine sediments to be mobilized from newly exposed soils by rainfall or stormwater runoff. The impact of any fine sediment transported to fish habitat depends in part on the time of year, watercourse gradient, and habitat type. If TESC measures failed, sediment would be transported to fish-bearing waters primarily during the winter when there would be sufficient stream energy available to mobilize and transport the material. Fine sediments are deposited in low-gradient streams (those with less than approximately 1 percent slope), which means that all streams and wetlands within the site, as well as the Green and Duwamish Rivers, are potentially vulnerable.

No spawning habitat suitable for anadromous salmon or resident trout is present on the site, and it is believed that no spawning habitat is found downstream of the site in receiving bodies of water. Thus, the highly vulnerable incubation stage of the salmonid lifecycle would have little to no risk of being affected by construction under Alternatives 1 or 2. However, juvenile and adult salmonids and other fish species are present in the vicinity of the site during the construction season and could be affected by increased fine sediment impacts, without implementation of the proposed mitigation measures.

Under Alternatives 1 or 2, minor and short-term discharge of fine sediments to the Green River would be expected to occur during infrastructure development, including: when the existing stream bank is removed from between the Green River Off-Channel Habitat Restoration Area and the Green River; during construction of the new Johnson Creek and stormwater outfalls through the Green River levee; and, if uncontrolled runoff enters Stream E or existing Johnson Ditch during the first year of infrastructure construction. With the use of Best Management Practices (BMPs), proper site inspection, and implementation of conditions of the required permits, including a National Pollutant Discharge Elimination System permit, Hydraulic Project Approval and Section 404 and 401 permit conditions, none of these sediment releases would be expected to cause significant adverse affects to aquatic habitat in the long term.

Under existing conditions, there are no significant deposits of coarse sediments on the project site that could be transported by streams across the valley floor. Therefore, there would be no potential for transport of coarse sediment from the site to fish-bearing streams, and no impacts would be expected from coarse sediment recruitment.

Impacts to Water Quality

Water quality components that are critical to fish habitat and most often affected by land development include water temperature, turbidity, toxic chemicals, metals, dissolved oxygen, nutrients, and pH. Construction measures designed to protect water quality, and their expected efficacy, are described in detail in Section 3.2, Water Resources, and Appendix C. (See Appendix E for further discussion of water quality in relation to fish habitat). All stormwater runoff during the infrastructure development phase would be treated per permit regulations; further, with nearly all construction runoff proposed to be managed by polymer treatment ponds at the south end of the site and discharged after testing to the Green River, the risk that sub-standard water would be discharged to the Green River would be low. Therefore, no significant adverse construction-related water quality impacts to fish or fish habitat would be expected.

Impacts to Listed Species

Chinook salmon is the only fish species listed under the federal Endangered Species Act (ESA) that occurs in significant numbers in the Green/Duwamish River watershed. Individual bull trout have been noted, but a resident population is not believed to be present. Infrastructure development impacts would not be expected to result in adverse effects to Chinook or bull trout due to proposed water quality mitigation, the reasonable likelihood that proposed mitigation measures would adequately protect aquatic habitat, and absence of spawning habitat within, adjacent to, or downstream of the site.

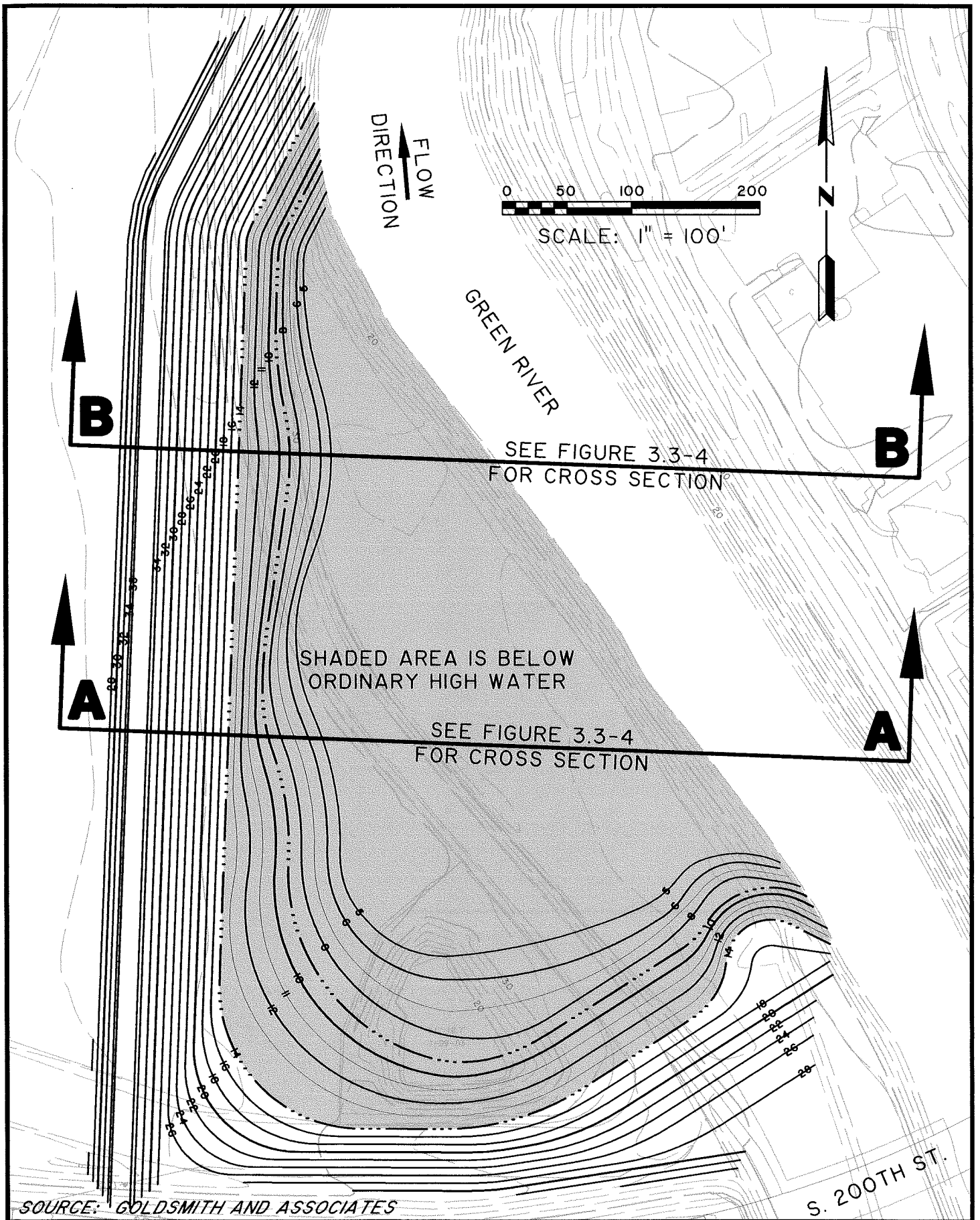
Impacts to Riparian Functions

Riparian buffers perform many functions essential to fish survival and productivity, including: maintaining cool water temperatures by providing shade, stabilizing stream banks to control erosion, and contributing food and nutrients (see Appendix E for details). It is not practical to directly compare the quantitative changes in riparian buffers between existing conditions and conditions that would exist subsequent to infrastructure construction and development under Alternatives 1 or 2. This is because of the substantive changes that are proposed to onsite watercourses under these alternatives. The watercourses proposed to be filled currently consist of shallow, narrow, linear features with riparian vegetation dominated by agricultural crops and maintained native and exotic species. Alternatives 1 or 2 would include an enhanced off-channel habitat area that would be much wider and more open than existing features (e.g., Green River off-channel habitat), and a meandering floodplain-style stream (e.g., new Johnson Creek). Riparian corridor widths on the new Johnson Creek would vary between about 30 feet and 100 feet on the north side of the channel and 30 to 60 feet on the south side of the channel and would be planted with native species. Buffers associated with Stream E would be planted where possible, between the remaining portion of the channel and the Southcenter Parkway alignment. This crescent shaped buffer area is expected to range between 0 and 80 feet in width. The 300 to 500 feet area west of Stream E is currently forested and would remain so under Alternatives 1 and 2.

The proposed riparian corridors and buffer widths are intended to enhance the natural functions of the retained watercourses, based on Best Available Science. (A comparison of current functions versus future functions of buffers on the site is summarized in Table 6 of Appendix E; Appendix E also contains a discussion of the science upon which the design of proposed buffer areas is based).

Proposed Habitat Enhancement

Two major habitat enhancement projects, the Green River Off-Channel Habitat Restoration Area and the new Johnson Creek stream channel, would be created as part of Alternatives 1 or 2. The Green River Off-Channel Habitat Restoration Area would be created as mitigation for impacts to the assumed fish-bearing agricultural ditches, and would include 4.5 acres of new open water habitat and 2.5 acres of upland riparian buffer and ditched streams (see Figure 3.3-3 for a plan and Figure 3.3-4 for a cross section of the Green River Off-Channel Habitat Restoration Area). As proposed, the Green River Off-Channel Habitat Restoration Area mitigation project would create new summer rearing, winter refuge, and upstream migration holding habitats. The new Johnson Creek would replace the existing Johnson agricultural ditch, resulting in 0.34 acres of new open water habitat to mitigate fill of 1.07 acres of agricultural



SOURCE: GOLDSMITH AND ASSOCIATES

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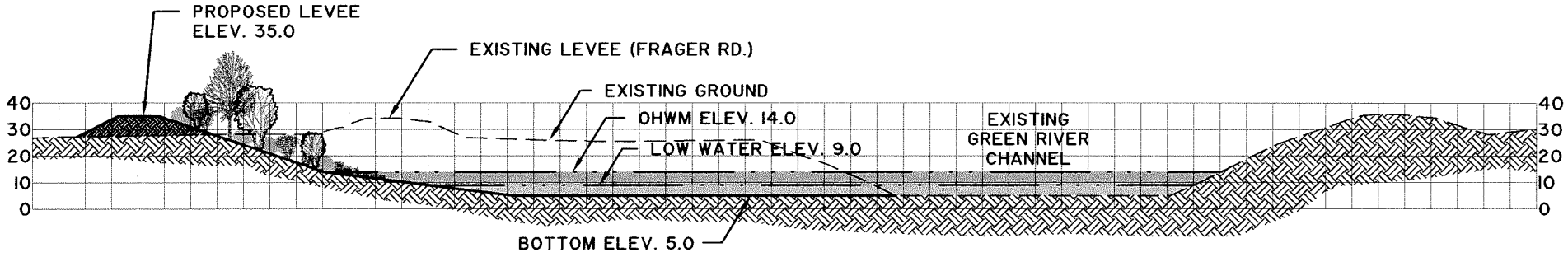
Figure 3.3-3
Green River Off-Channel Habitat Restoration Area Plan

Tukwila South Master Plan EIS



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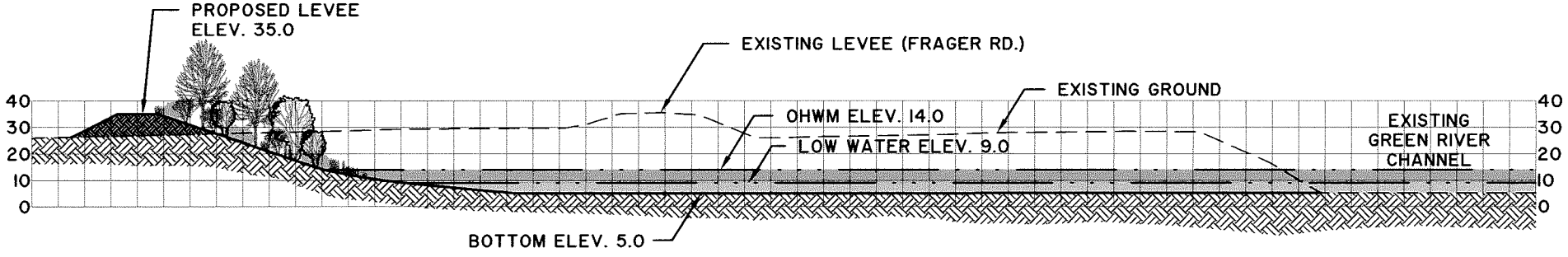
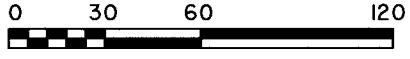


SECTION A - A



SCALE 1" = 60'

SOURCE: GOLDSMITH AND ASSOCIATES

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Figure 3.3-4
Green River Off-Channel Habitat Restoration Area Cross Sections

Tukwila South Project EIS

ditches (see Figures 3.3-5 for a plan and Figure 3.3-6 for a cross section of the new Johnson Creek restoration). The Johnson Creek realignment would create a meandering stream channel designed to provide summer rearing and winter refuge habitats.

Together, the Green River Off-Channel Habitat Restoration Area and Johnson Creek realignment would provide over four times the area of habitat lost during development under Alternatives 1 or 2. The lower habitat quality agricultural ditches and ditched streams would be replaced with high quality habitat of the type currently believed to be in short supply within the lower Green/Duwamish watershed. The current absence of this type of high quality habitat is believed to be limiting regional anadromous salmonid populations (Washington Conservation Commission and King County Department of Natural Resources, 2000).

Full Buildout

As described above, the infrastructure development phase would result in nearly all of the substantive changes to plant communities, animals and fisheries resources that would be expected under Alternatives 1 and 2. Once this infrastructure development phase is completed, future development would likely occur over an extended period of time. However, no additional clearing would be expected and the overall impacts to plant communities, wildlife and fisheries would generally be as described above for the infrastructure development phase.

Plant Communities

During full buildout, parts of the development areas not occupied by buildings, roads, or other impervious surfaces would likely be landscaped with ornamental species. Some ornamental species, such as English ivy, which is shade tolerant, can invade native forests and spread to reduce understory diversity and threaten the health of overstory trees. Other non-native ornamental species, such as English holly, can spread through animal (bird) dispersal, and thus can become established farther from developed areas. Scattered English holly has been observed in the forested portions of the Tukwila South site.

As development occurs over time, the grasses seeded on the parcels to stabilize soils as part of the infrastructure phase would be cleared, and would be replaced by buildings and other impervious surfaces, as well as landscape plantings. The artificial edges created between retained vegetation communities and cleared, graded areas during the infrastructure construction phase would remain, but the developed areas would likely have more limited vegetation consisting of ornamental species in clearly defined spaces.

Additional impacts to retained wetland and riparian vegetation communities, beyond the direct impacts described under infrastructure development phase, could occur from hydrologic impacts of development under Alternatives 1 or 2. However, most of the proposed development area either lies downgradient or otherwise outside the contributing basins of most of the retained wetlands, and none of the stormwater runoff from developed areas would be discharged to any of the retained wetlands. Therefore, no adverse impacts to hydrologic conditions would be expected, and no significant impacts to vegetation communities in retained wetlands are expected (see Section 3.4, Wetlands, and Appendix F for further information).

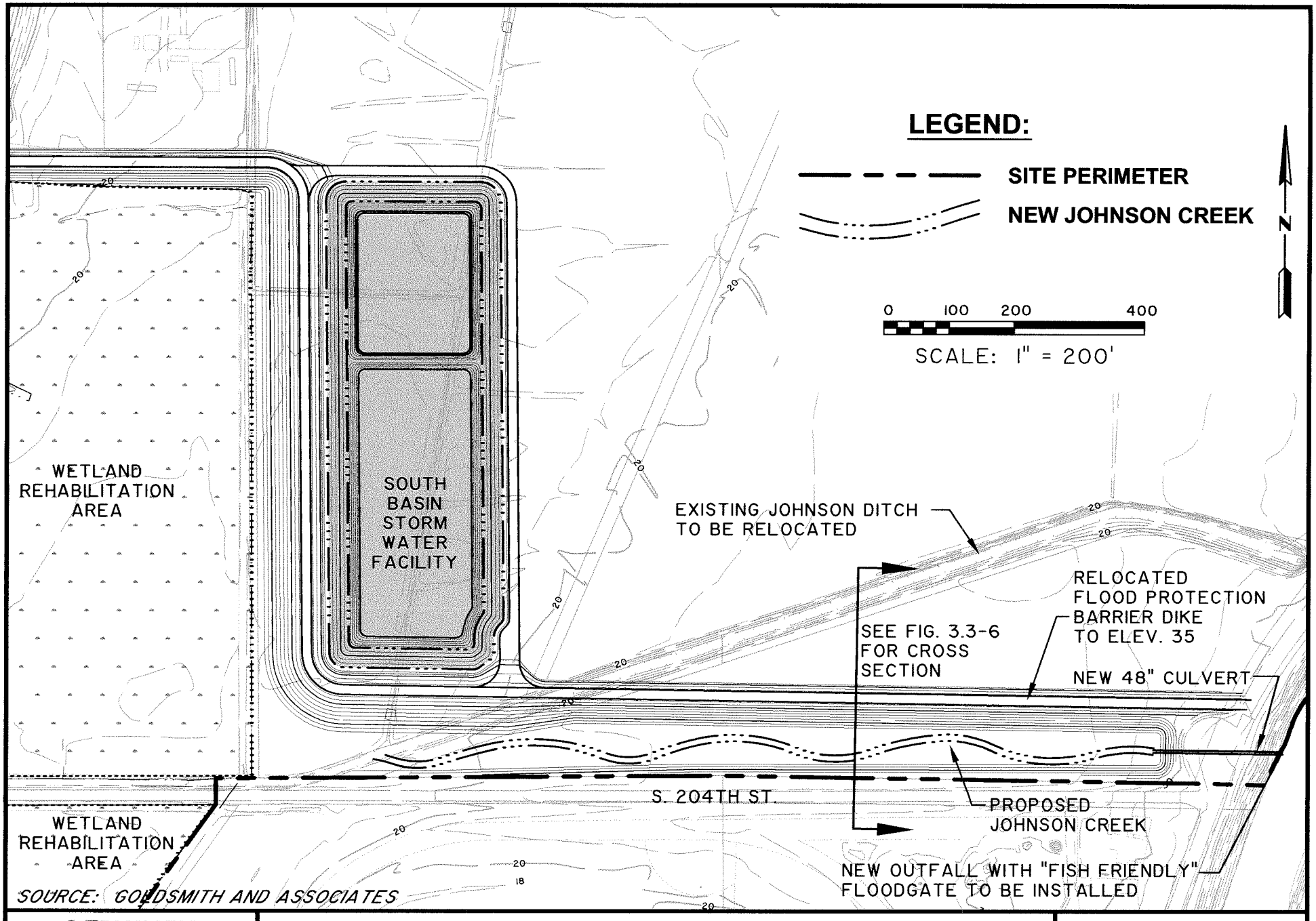

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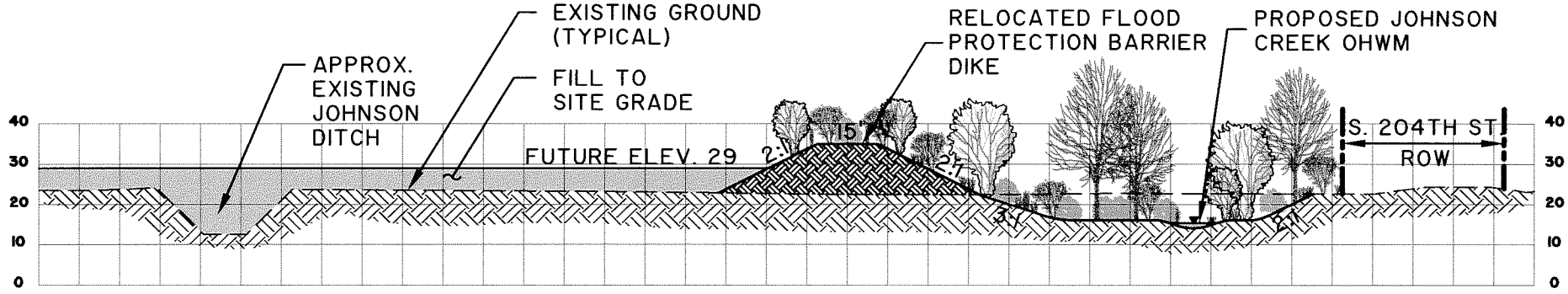
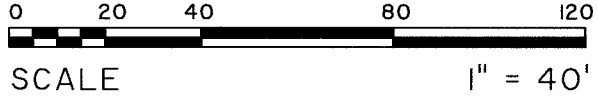
Figure 3.3-5
Johnson Creek Restoration Plan

Tukwila South Project EIS





SOURCE: GOLDSMITH AND ASSOCIATES

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Figure 3.3-6
Typical Cross Section of Johnson Creek Restoration Plan

Tukwila South Project EIS

Wildlife

Urban development can alter the quality and quantity of wildlife habitat. By fragmenting natural habitats into smaller, more isolated units, development can remove the habitat of many species, modify habitats of others, and create new habitat for some species. Impacts to wildlife from development include direct loss and alteration of existing native habitat, loss of agricultural lands that provide at least seasonal habitat for some species, and increased levels of human activity. These impacts can alter the shape, size, and connectivity of remaining habitats for wildlife, which in turn can affect population dynamics of species using retained habitat patches.

Conversion of much of the site from native forest and agricultural land to urban development and associated roads and facilities would result in a substantial change in available habitats. Development of on site roadways during full buildout could further reduce movement of many species of wildlife. Conversion of cleared areas to buildings and associated paved surfaces during this phase could also reduce potential avenues of movement.

As building development occurs and is occupied, urban-adapted species would increase and could displace native species that are not adapted to urban areas, as described for the infrastructure development phase. In particular, as residential uses are occupied, domestic cats and dogs could increase in abundance and could act as "super-predators," increasing in abundance and contributing to reductions of non-urban-adapted native species.

Long-term impacts to wildlife and wildlife habitat are assumed to be similar under Alternatives 1 and 2. Under Alternative 2, a somewhat less dense development pattern could result in more open space between buildings and larger areas of landscaping than under Alternative 1, although for purposes of this Draft EIS and preliminary Master Drainage Plan, the same area of impervious surfaces is assumed. If more open space were to be available between buildings for landscaping, this could provide slightly more potential habitat for urban-adapted species, such as American robin, sparrows, finches, swallows, and crows, than under Alternative 1.

As discussed under Plant Communities, potential hydrologic impacts to retained wetlands under Alternatives 1 and 2 would not be expected to result in significant adverse impacts to vegetation communities. Consequently, no significant adverse impacts to wetland-associated wildlife in retained wetlands would be expected during full buildout (see Section 3.4, Wetlands, and Appendix F for further discussion).

At full buildout, ambient light (from exterior lighting of buildings, walkways, roads and traffic) would increase over existing conditions, particularly compared with existing agricultural uses onsite (see Section 3.11, Aesthetics, for a discussion of light and glare impacts at buildout). This additional lighting could affect activity patterns of animals and movements and temporal densities of their prey. Some increased noise levels, primarily from vehicular traffic, would also be expected with full development of the site (see Appendix K and Section 3.14 of the DEIS for further information on the noise analysis). Given the current urban character of portions of the site and surroundings, increases in ambient noise at full buildout would be incremental and irregular, and on average would not likely be significant. These affects would be considered part of the indirect impacts (aside from loss of habitat) on wildlife from increased urbanization of the site. Given the existing urban nature of much of the site, including heavily-traveled roads, potential impacts from increased light and noise levels on wildlife would be considered incremental and would not be expected to be significant in the context of the overall loss of habitat.

Fisheries

Impacts on fisheries resources under Alternatives 1 and 2 during full buildout are discussed below. As described previously, impacts to fisheries resulting from Alternatives 1 and 2 would be similar.

Direct Impacts

No direct impacts to streams/ditches beyond those that would occur during the infrastructure development phase would be anticipated during full buildout. The only direct impacts to fisheries would be the beneficial change in aquatic habitat created within the Green River and new Johnson Creek. Under Alternatives 1 or 2, approximately 3.8 acres of open water habitat would be created compared to existing conditions. This habitat would become fully established during full buildout. As a result of these newly created habitat areas, there would be a substantial increase in higher quality resident and anadromous fish habitat on the site, providing rearing, water refuge and juvenile migration opportunities. Upstream fish passage from the Green River into new Johnson Creek would be improved with the new larger and shorter culvert under the levee, the fish-friendly flood gate, and the lower outfall elevation. See Appendices E and L for a complete description of the benefits of the Off-Channel Habitat Restoration Area and Johnson Creek realignment.

Sediment Recruitment Impacts

Once buildings and roadways are completed and landscaping and other vegetative cover established, the risk of erosion would be similar to that under existing conditions. Groundwater fed spring flows and instream flows would not be expected to change under Alternatives 1 and 2; thus, instream erosion and sediment transport would not be affected. Potential erosion hazards could be mitigated to very low levels with proper implementation of BMPs (see the Section 3.1, Earth, and Appendices A and C for further discussion and a list of proposed erosion-related mitigation measures). Therefore, no significant impacts related to fine sediment recruitment would be expected during full buildout.

Streams on the hillside within the western portion of the site have the capacity to transport coarse sediment due to the steep stream gradient. However, once the streams reach the relatively flat valley floor, coarse sediment is deposited near the base of the hillside. Coarse sediment deposits are present along the steep slopes within the western portion of the site. However, the large flat depositional area between the steep slopes and the Green River have precluded any of this material from being carried to the Green River. With the Green River levee in place, the opportunity for the site to contribute coarse sediment to the Green River is remote. Sediment deposits along the toe of the slopes present some opportunities for fish spawning where stream channels cross the deposits (e.g. Streams E-2 and J-2). None of these channels or contributory areas would be affected by development. Thus, development-related changes to the watercourses would not be expected to have any significant impact on coarse sediment recruitment during full buildout.

Impacts to Water Quality

Impacts to water quality from Alternatives 1 and 2 are described in detail in Section 3.2, Water Resources, and Appendix C. Fish sensitivity to water quality changes was assessed by evaluating data in the literature for behavioral and physiological fish responses to sub-lethal

concentrations of typical stormwater runoff contaminants. Sub-lethal effects include water chemistry-induced changes in physiology and/or behavior that affect the competitive vitality or reproductive potential of a fish population without direct lethal effect. Forecast water quality results were compared to desirable limits (see Table 7 in Appendix E). See Appendix C for a detailed analysis of water quality impacts from the alternatives, and Appendix E for further discussion of background water quality and its suitability to fish.

While the load of some stormwater contaminants in the water discharged from the site during full buildout would be higher than in the receiving body of water (the Green River), the maximum seasonal contribution of site discharge to river flow is conservatively estimated to be less than 0.07 percent. Given this slight contribution relative to background concentrations in the Green River, stormwater quality would be at acceptable levels to preserve and protect fish habitat. Thus no risk to fisheries resources in the Green River from onsite stormwater discharge would be expected.

The overall quality of stormwater discharged from the site is expected to increase under Alternatives 1 and 2, as compared to existing conditions. The current annual application of approximately 61,600 pounds of fertilizer and 252 gallons of herbicide to the agricultural fields would cease. Stormwater discharged to natural receiving bodies of water would not cause lethal or sub-lethal effects to salmonid fishes. All evaluated parameters within fish-bearing waters in the Green River and new Johnson Creek are forecast to be within levels deemed acceptable for water quality in hatcheries, a condition more stressful to fish than the natural environment.

Groundwater Quantity Impacts

Maintaining groundwater flow quantities is critical to protecting fish habitat, especially during the summer low-flow period when most if not all stream flow in onsite streams (not including the Green River) is derived from aquifer discharge. In general, development of the site during full buildout would not result in any significant adverse effects to groundwater quantity being delivered to fish-bearing waters. New Johnson Creek is expected to have slightly more base flow contribution from regional aquifers due to its minor change in location within the alluvial aquifer. No measurable change in Stream E or the Green River would be expected. No change is expected to flows in Streams E-1, E-2, E-3, G, H or J-2. A detailed analysis of potential impacts to hillside springs and the alluvial aquifer, which supply base flow, is contained in Appendix A to this Draft EIS. The quantity, delivery and routing of discharge are evaluated, relative to potential impacts to assumed fish-bearing waters.

Surface Water Quantity Impacts

The proposed stormwater control facilities for the site are described in Section 3.2, Water Resources, and Appendix B. While most stormwater control standards are designed to protect channel stability from peak storm flows, fish habitat quality is dependent on the more commonly experienced flows (base flow). Hydrologic modeling was conducted to calculate future instream flows under full buildout.

Table 9 of Appendix E shows base flow contribution from the site to the Green River. No significant change in the summer base flow contribution from the site to the Green River would be expected to occur as a result of Alternatives 1 or 2, and no change to fish habitat quality would reasonably be anticipated. Changes to flows from the site during the winter would also be insignificant relative to flows in the Green River (0.03 percent to 0.06 percent decrease).

Table 10 in Appendix E shows expected changes in peak storm flows in the Green River. With the increase in impervious surfaces, storm flows leaving the site would be expected to increase flows in the Green River over existing conditions by a very small amount (less than 0.24 percent).

More important than the quantity of flow increase is the effect on habitat quality as measured by the depth and velocity to which fish would be exposed. Average water depth in the Green River would increase by about 0.05 ft (1/2 inch) and average water velocity would change by about 0.01 foot per second or less. While these changes are both small, the most important impact on fish habitat quality related to storm events would be the newly created availability of off-channel refuge habitat, proposed as mitigation. The 7 acres of off-channel habitat area in the Green River would provide an area for fish to go to avoid high water velocities.

Base flows in the existing Johnson Ditch are the result of aquifer discharge from the hillside on and to the west of the site and alluvial aquifer discharge on the valley floor. As discussed above, significant changes to base flows and fish habitat dependent on these flows would not be expected (see Appendix A for details).

New Johnson Creek stream flows were evaluated for the peak storm flow range (see Table 11 of Appendix E). The proposed stormwater management system for Alternatives 1 and 2 calls for reducing the existing flood storage by constructing a flood barrier dike near the southern boundary of the site. The overall drainage area tributary to new Johnson Creek would also be reduced. The expected differences in peak flow rates between existing and future conditions would be largely due to the dual requirements to provide flood storage and facilitate fish passage. As a result of a new larger culvert to the Green River, peak flows discharging from new Johnson Creek would be higher. However, flow rates cannot readily be compared with existing conditions in order to evaluate fisheries impacts, because new Johnson Creek would be redesigned as part of the project to optimize conditions for fish habitat.

Reconfiguration of Johnson Creek would result in channel conditions more suitable for fish than are found under current conditions (high flow refuge area). Because fish respond more to water velocity than overall flow, velocities are a better indicator of fish habitat quality than flow rates. Future estimated new Johnson Creek water velocities are summarized in Table 12 of Appendix E. The most common water velocities in the proposed Johnson Creek channel (50 percent exceedence flows) would be within the preferred range for coho salmon. Most predicted peak flow water velocities in the new Johnson Creek would be within the range where most fish could readily move through them to find and position themselves in refuge habitats where velocities are lower. Velocities would vary within the channel to provide this refuge habitat. If the average channel velocity was lower or higher than preferred, fish move through the channel to locate and occupy a portion of the channel with velocity more to their preference.

Impacts to Channel Erosion and Sedimentation Processes

An erosion and sedimentation analysis was conducted for surface water drainages potentially affected by development under Alternatives 1 or 2. While the area to be developed consists primarily of very low-gradient slopes that do not provide an appreciable source of coarse sediment to fish-bearing waters, steeper slopes adjacent to tributaries draining the west side of the valley are vulnerable to erosion and large slope failures. However, with proper implementation of the proposed mitigation measures (BMPs), significant erosion hazard impacts for Alternatives 1 and 2 would not be expected, even in areas where a high erosion hazard risk

is present (see Section 3.1, Earth, and Appendix A for further discussion of erosion hazard impacts.

Under existing conditions, both the Green River adjacent to the site and existing Johnson Ditch are very low gradient, silt-bedded channels with little capacity to transport coarse sediment. Based on hydrographic modeling, stream flows after development under Alternatives 1 and 2 would be similar to existing conditions. While the redesigned Johnson Creek would have higher peak storm flows, the specific design of the new channel would take this into account to prevent erosion. Therefore, no adverse impacts to sediment transport or stream erosion would be anticipated during full buildout (see Section 3.1, Earth, and Appendix A for further discussion of erosion hazards impacts).

Potential for Fish Stranding

Under Alternatives 1 and 2 historic habitat conditions would be recreated over approximately 40-acre area of the site. With improvements in habitat quality and enhanced access through the levee, it is expected that fish use of the area would increase. With more fish using the site, the number of fish that could potentially become stranded would increase. Final design and construction monitoring would include measures to ensure that "attractive nuisances", such as isolated ponding areas, would not be intentionally created. Future monitoring would also include an assessment of potential stranding hazard locations that might develop over time and observations for any stranded fish or carcasses. With these measures, it is expected that stranding risk would be kept to a minimum and be no greater than under historic conditions.

Impacts to Listed Species

The Chinook salmon and bull trout are the only fish species listed under the federal ESA known to occur in the region. No significant impacts to these species would be expected since no significant changes to physical habitat or water quality conditions would result, and because neither Chinook nor bull trout spawn within, near, or downstream of the site. Juvenile Chinook rearing habitat would be expected to improve as a result of the proposed mitigation.

Sensitive Area Master Plan

The applicant proposes to develop the site and mitigate environmental impacts under a Sensitive Area Master Plan. Alternatively, the site could be developed under the standard provisions of the Tukwila Municipal Code (TMC), without a Sensitive Areas Master Plan. The proposed Sensitive Areas Master Plan includes three major habitat enhancement projects: the Green River Off-Channel Habitat Restoration Area, the realigned Johnson Creek stream channel and a wetland rehabilitation plan. The analysis presented in this Draft EIS assumes implementation of these habitat enhancement features. See Appendix L for a detailed comparison of potential impacts to fisheries habitat under the proposed Sensitive Areas Master Plan, as compared to impacts under Alternatives 1 and 2 if they were configured and mitigated under standard TMC code provisions.

Indirect/Cumulative

The Tukwila South project would represent a continuation of the trend toward urban development in the area and throughout the Urban Growth Area. This would include loss of some native vegetation communities and fragmentation of others. With elimination and

fragmentation of certain plant communities, some animals would move to other habitats and some would perish, and a continued incremental shift in species composition to favor species more adapted to urban areas would result. However, much of the habitat that would be altered or eliminated on the Tukwila South site is of relatively low quality. In particular, the degraded wetlands in agricultural use currently provide limited habitat value. Creation of new habitat associated with the Green River Off-Channel Habitat Restoration Area, new Johnson Creek, and associated wetland rehabilitation would result in the rehabilitation of some plant communities and in new, higher quality habitat for wildlife resulting in a net benefit to the surrounding area.

All watercourses that would be affected by infrastructure development under Alternatives 1 or 2 are manmade agricultural ditches/ditched streams; no natural channels would be affected. Elimination of some of the agricultural ditches and adjacent farming practices would be expected to result in improvements to regional water quality, including within the Green River. Additionally, the proposed wetland rehabilitation plan is intended to result in an overall increase in wetland functions in the site area.

The Tukwila South site drains to the Green River just upstream of the tidally influenced area. The Green River at this location is a highly managed river, both in terms of instream flows and channel character. The proposed stormwater management system would include both water quality treatment and control of the quantity of flows of stormwater that would be discharged to receiving waters. As a result, Alternatives 1 or 2 would not be expected to contribute to any adverse basin or downstream fish habitat effects.

No Action Alternative

The extension of Southcenter Parkway to S 200th Street, under a modified alignment, is assumed under the No Action Alternative (see Figure 2-10 in Chapter 2 of this Draft EIS). The No Action Alternative also assumes no relocation of the existing flood protection barrier dike, and limited changes to existing wetland and watercourse conditions. Thus, without relocation of the dike, the southern portion of the site would not be developed as under Alternatives 1 and 2.

Plant Communities

The No Action Alternative would result in less direct impacts to existing vegetation communities than Alternatives 1 and 2. The agricultural fields in the southern portion of the site would remain, and would likely continue to be managed for production of corn or other crops. The undeveloped areas in the central and northern portions of the site would be converted to industrial and retail uses over time, including portions of the forested and shrub-dominated slopes outside of sensitive areas such as wetlands, streams, and steep slopes. The majority of forest cover on the hillside, including both uplands and wetlands, would likely be retained.

Without development of the southern portion of the site, this alternative assumes that no wetlands would be filled. However, the southward extension of Southcenter Parkway would fill 327 linear feet of Stream E, which would be considered wetland fill for regulating purposes. It is assumed that mitigation would, therefore, be limited to that required to compensate for impacts to Stream E. The comprehensive habitat mitigation plan, proposed under Alternatives 1 or 2, would not be implemented.

Wildlife

Under the No Action Alternative, similar impacts to wildlife would occur in those portions of the site (north of the existing flood control barrier dike) that would be developed, as under Alternatives 1 and 2. For purposes of this analysis, it is assumed that the agricultural fields, hayfields, and other wetlands would remain largely in their current condition and managed similarly to under existing conditions. To the extent that these areas provide habitat at least seasonally for a number of species, such as seasonal foraging habitat for waterfowl, killdeer, swallows, and raptors, these habitats would remain under the No Action Alternative.

As under Alternatives 1 and 2, no adverse impacts to endangered, threatened, or sensitive wildlife species would be expected under the No Action Alternative, as none are known or expected to occur on the project site. Within the developed areas of the site, including portions of the existing forest habitat, impacts on potential habitat for endangered, threatened, sensitive, and other priority species would be similar to those described under Alternatives 1 and 2. However, with retention of the agricultural fields in the southern portion of the site, some potential foraging habitat for species, such as eagles, falcons, and herons, would be retained, in contrast to under Alternatives 1 and 2.

Fisheries

As mentioned above, construction of the Southcenter Parkway extension under the No Action Alternatives would require filling of 327 feet of Stream E, which is a presumed fish-bearing channelized watercourse. The channel would likely be realigned and enhanced to provide an equal amount of stream channel as that filled. Instream structure would likely be created to provide similar or better aquatic habitat than what currently exists. A riparian buffer along both sides of the channel would likely be set aside and planted as required under the City of Tukwila Sensitive Areas Ordinance. None of the other watercourses on the site would be impacted. However, certain onsite ditches and ditched streams would continue to be used for agricultural purposes in the southern portion of the site (Streams C, D and Ditch J-1), as would existing Johnson Ditch. Fish access to existing Johnson Ditch would continue to be limited by the flood gate at the Green River.

Infrastructure development impacts to aquatic habitat would be much less than under Alternatives 1 and 2. With less in-water construction, the potential risk to fish would be less. Development of the No Action Alternative would have less potential for impacts to water quality than construction under Alternatives 1 and 2, because of the reduction in areas to be graded. However, the significant fish habitat benefits realized by the Green River Off-Channel Habitat Restoration Area and the Johnson Creek realignment would also not be realized. Further, nothing proposed under the No Action Alternative would preclude fish habitat improvements from being completed in the future.

At buildout, the No Action Alternative would provide a lower density of development and smaller amount of new impervious surfaces, but would retain the existing limited stormwater quality treatment in both the northeast (Segale Business Park) basin and the lack of water quality treatment associated with the agricultural uses in the south basin. Overall, the potential risk to fish would be less under the No Action Alternative than under Alternatives 1 and 2. The potential benefits to fish from the Sensitive Area Master Plan under Alternatives 1 and 2 would also be less, however.

3.3.3 Mitigation Measures

- The majority (approximately 80 percent) of the onsite wetland areas and their buffers, together with the natural streams and most of the steep slopes, would generally be protected under either Alternative 1 or 2. The retained wetland, wetland buffer areas, and steep slopes would provide a base level and configuration of native habitat for wildlife on site.

- The areas of native habitat within the retained open space areas on site (primarily the hillside) would include existing habitat elements, such as snags, defective live trees, and logs, which could be used by a variety of wildlife.

- Compensatory mitigation for impacts to wetlands and watercourses would be implemented in accordance with the City of Tukwila (as well as State and Federal) permitting requirements. A comprehensive Sensitive Area Master Plan would be implemented in the infrastructure development phase (see Appendix L for details). The plan was developed in accordance with the Sensitive Area Master Plan provisions of the City of Tukwila's Sensitive Areas Ordinance (TMC 18.45.160). Implementation of the plan is intended to compensate for impacts to watercourses and wetlands, and is intended to yield substantial net benefits to the environment that would not be realized under the standard provisions of the Sensitive Areas Ordinance. The primary features of the habitat mitigation plan are as follows:
  - Rehabilitation of a wetland complex associated with tributary drainage to the Green River that was historically present, but is now absent in the basin. See Section 3.4, Wetlands and Appendix F for further discussion.
  - Creation of off-channel fisheries habitat in the Green River (see Figures 3.3-2, 3.3-3 and 3.3-4).
  - Implementation of a stream mitigation plan, including restoration of existing Johnson Ditch into a fish-friendly tributary (new Johnson Creek; see Figures 3.3-5 and 3.3-6) connected to the Green River.

- The proposed habitat enhancement projects (i.e., the Green River Off-Channel Habitat Restoration Area and new Johnson Creek stream channel) would compensate for impacts to the existing ditches and ditched streams on a more than 4:1 ratio (by area).

- All areas that are to remain undisturbed during site clearing and grading (e.g., sensitive areas and their buffers) would be delineated and fenced with highly visible material prior to construction.

- All construction at or below the OHWM of the Green River would take place in August.

- No surface water runoff from construction areas would be discharged directly to onsite or offsite waterbodies without first being treated (see Section 3.2, Water Resources, and Appendix C for details).

- Fish removal and hydraulic isolation measures would be implemented prior to filling of waterbodies. Other measures as required by agency permits, including Hydraulic Project Approval (WDFW) and Section 404 (Army Corps) permits, would be implemented.

- Monitoring of the Chinook population in the Green River would be conducted to ensure that proposed activities on the river bank do not prevent upstream migration. Should a large contingent of fish be observed waiting downstream of the site, construction would be temporarily halted to allow fish the opportunity to swim past with less disturbance.

- The Green River would be screened from noise and visual disturbances related to construction truck traffic to reduce the potential for impacts to aquatic resources.

- Where Stream E remains as a surface feature, the area between the channel and Southcenter Parkway would be planted where practicable with native tree and shrub species and allowed to naturalize. The area west of the channel would remain untouched as native forest.

- Final design and construction monitoring would include measures to ensure that "attractive nuisances" to salmonids, such as isolated ponding areas where fish might become stranded, are not intentionally created.

- Post-construction monitoring would include an assessment of potential stranding hazard locations that might develop over time and observations of any stranded fish or carcasses.

- Additional mitigation measures described in Sections 3.1, Earth, and 3.2, Water Resources, and Appendices A and C would be implemented to protect water quality, water quantity, stream channel stability, riparian buffers, and wetland conditions during construction.

- Mitigation measures described in Sections 3.1, Earth, and 3.2, Water Resources, and Appendices A and C would be implemented to provide long-term protection of water quality and water quantity, and would also be relevant to the protection of fisheries resources.

- Landscaping could include native plant species, where feasible, especially trees and shrubs that provide groundcover for nesting birds, cover for small mammals, and feeding sites to help increase habitat values of otherwise altered landscapes.

- The use of exotic ornamental species could be discouraged.

- Landscape irrigation design concepts could encourage the use of water-conservation, low-volume irrigation.

3.3.4 Significant Unavoidable Adverse Impacts

Development of the site under either Alternative 1 or 2 would result in the following unavoidable adverse impacts:

- Loss of the portions of the existing remaining native vegetation and soils and replacement with developed areas that would include impervious surfaces; and fragmentation of retained native vegetation communities among the developed areas onsite;

- Reduction in the local populations of most native wildlife species on site over time, and continued incremental shift in species composition to favor species more adapted to urban

areas; some wildlife species could be eliminated from the site; those animals displaced from the site to adjacent off-site habitats would likely perish; and

- Increase in disturbance of the patches of native forest habitat retained onsite as a result of increased human activity.

Alternatives 1 and 2 would also include filling of 7,127 feet (1.07 acres) of stream channel, much of which is potentially fish-bearing; however, all affected stream channels are manmade agricultural ditches and ditched streams, and habitat is poor to non-existent. The proposed fill would not be considered a significant adverse impact, particularly with implementation of the proposed mitigation plan, including the two major habitat enhancement projects: the Green River Off-Channel Habitat Restoration Area and the new Johnson Creek stream channel. Development under Alternatives 1, 2 or 3 would not be expected to result in significant unavoidable impacts to fisheries resources.